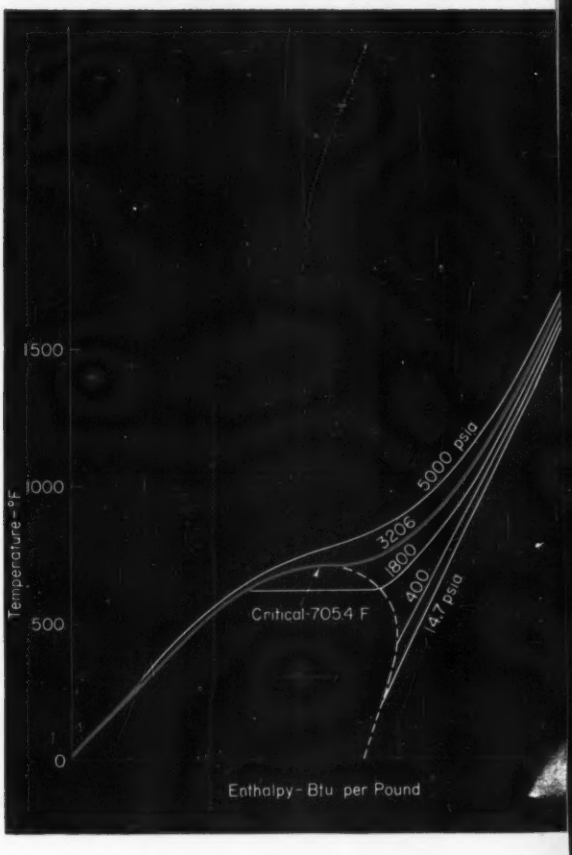
The Electrical Industry's Weekly Magazine

December 10, 1956

Electrical World

Price 35 Cents

A McGraw-Hill Publication



Utilities Pick Supercritical Steam for 1.9 Million Kw

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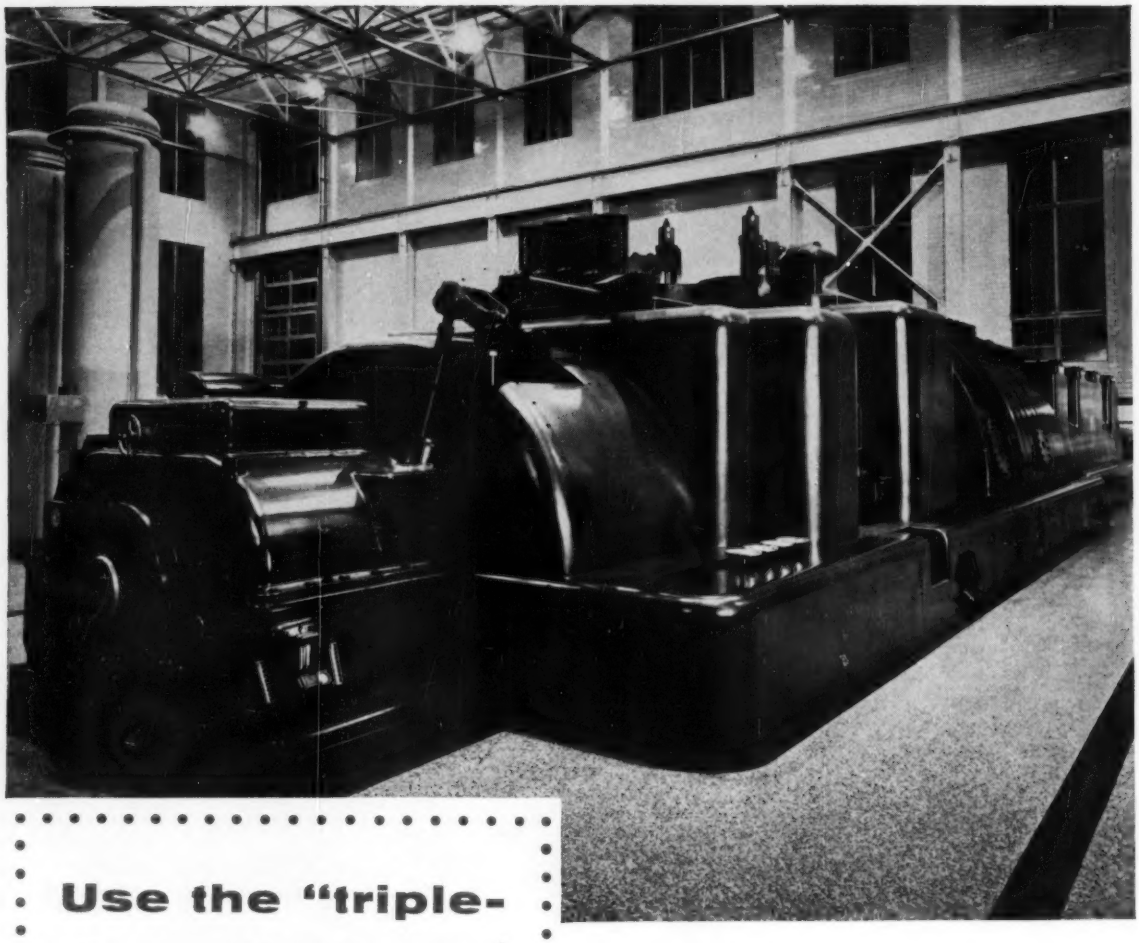

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ELECTRICAL WORLD

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 24 **December 10, 1956**

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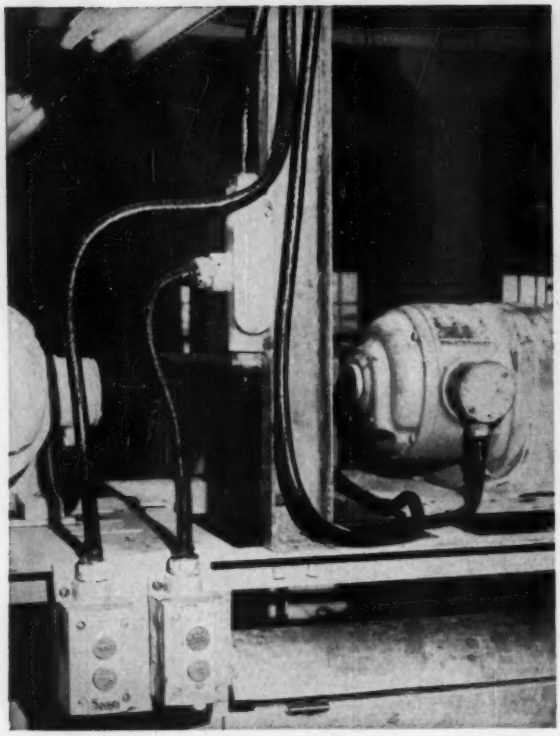
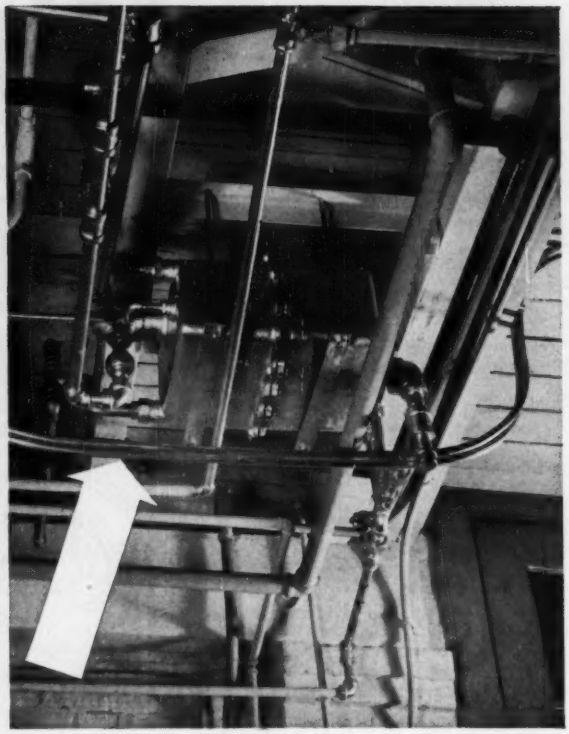


Simple terminations—aluminum-sheathed cables are as simply terminated as conventional rubber-insulated control cables. For leads to motors and control apparatus, an aluminum sheath also provides a neat, space-saving installation. This photo shows optional Okosheath Protective Covering applied over aluminum sheath to combat an extremely corrosive atmosphere in this installation.



Easy installation—aluminum-sheathed cable is inherently rigid, yet see how easily it can be installed around pipes, heat exchangers, and other obstructions. Conduit is eliminated. Regular conduit clamps give all the support necessary for overhead installations. Note that aluminum sheath is seamless, providing a permanent moisture-proof barrier.

new aluminum-sheathed cables eliminate conduit

Many advantages are obtained from the addition of a *seamless* aluminum sheath over standard cable constructions. Virtually any Okonite cable —including rubber, plastic, varnished cambric and paper-insulated constructions—can now be obtained with an Okonite aluminum sheath.

A list of the advantages resulting from this new technique is in the next column. For further information, write to The Okonite Company, Passaic, N. J.

- **no conduit—cuts installation time and costs**
- **eliminates pulling problems and possibility of damage to conductors**
- **high tensile strength and rigidity, yet easily bent with standard tools**
- **impervious barrier to liquids and vapors**
- **mechanically strong**
- **excellent flame resistance**
- **simple terminations**
- **small diameter, light weight**

3502

OKONITE insulated cables

Rely on Graybar . . .

ESPECIALLY IN EMERGENCIES

Graybar's long experience in serving the everyday needs of utilities is especially valuable when lines go down.

A nation-wide network of Graybar offices and warehouses provide ready accessibility of pole-line supplies. You can depend on the fastest possible deliveries of emergency replacement items —wherever and whenever they are needed.

Experienced Graybar personnel have developed the know-how needed to initiate immediate action and efficient follow-through from working closely with utilities daily and through emergencies of all kinds.

Moreover, Graybar is totally owned by its operating and retired personnel. That's why you're sure to get, especially in emergencies, *personal* service from people who have a *personal* interest in giving you the assistance you need, when you need it.

619-912

Graybar Electric Company, Inc.
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IN OVER 130 PRINCIPAL CITIES

NOW... LOADBUSTER

Breaks Loads with Open Cutouts

LOADBUSTER is ruggedly built for repetitive service with S&C open cutouts wherever they are applied. There is no broken link to replace after switching. Both the cutout and LOADBUSTER are ready immediately for repeat service. Moreover, the high interrupting capability of LOADBUSTER permits load breaking even when the cutout carries the 200 ampere disconnect blade. Also, it can interrupt any steady overload the cutout may be carrying (as much as 200 amperes with a 100 ampere link).

- **Put LOADBUSTER on each of your line trucks**
- **With it your lineman is ready to break the circuit instantly up and down your distribution system**
- **It just hooks across an S&C disconnect or S&C open-type cutout to provide safe, arc-free interruption**

.....A *Portable* LOADBREAK TOOL

With the advent of the revolutionary LOADBUSTER, an entirely new concept in circuit switching is born, one that brings complete, positive, safe switching for distribution systems within the reach of any utility's pocketbook. For LOADBUSTER is a circuit interrupting device which is portable, is repetitive, and is universal.

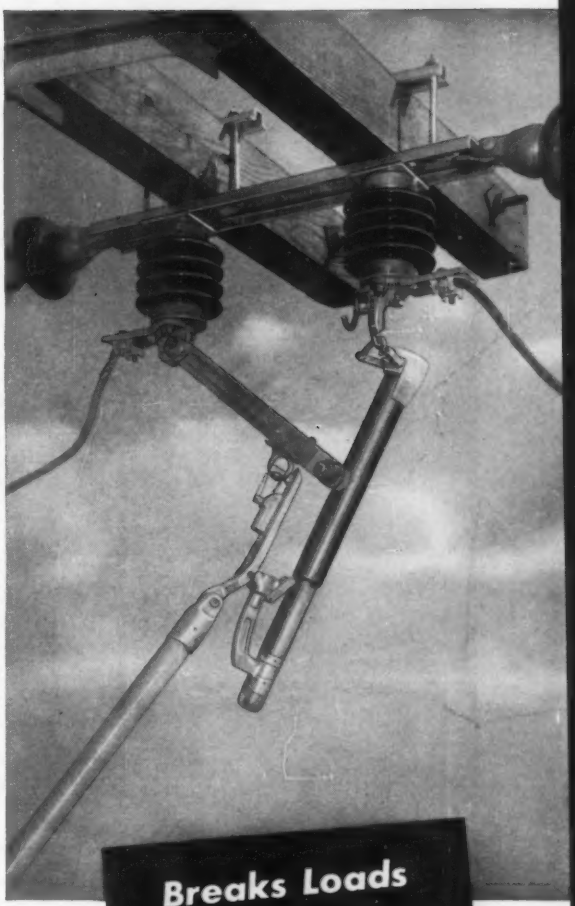
Disconnects and cutouts inherently have no positive switching capability. To get it, some interrupting means must be built into them. For example, a link breaking device must be built into an open cutout; an interrupting unit into a disconnect which then makes it a load interrupter switch. This costs money !!! BUT, bringing the interrupting device to the disconnect or cutout only when needed eliminates this cost . . . that's what LOADBUSTER does . . . it's a loadbreak tool.

With LOADBUSTER you can drop all tedious, uneconomical, and unsafe switching practices. Attached readily to a universal pole, LOADBUSTER is simply hooked across the upper contact of a disconnect or cutout which is then opened in the normal way. It's just that easy! There's no arc, no link breakage, no fuss, no worry, no contact burning, and no danger to the operator. After use, LOADBUSTER is returned to the truck ready for instant use again anywhere.

LOADBUSTER can be used over and over again. It will withstand daily field usage over a long period of time without requiring maintenance. On the other hand, because it's portable, it's available for easy inspection. It's a circuit interrupting device that can always be kept in top-notch condition.

LOADBUSTER is operable at any distribution system voltage through 14,400 volts, and is able to break all load currents through 400 amperes, as well as associated magnetizing and charging currents. It can also switch all pole-top capacitor banks.

Ask for Descriptive Bulletin No. 730.



LOADBUSTER provides arc-free circuit interruption with S&C disconnects rated 400 amperes and 14.4 kv. It also will be usable with an S&C pole-top regulator switch.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

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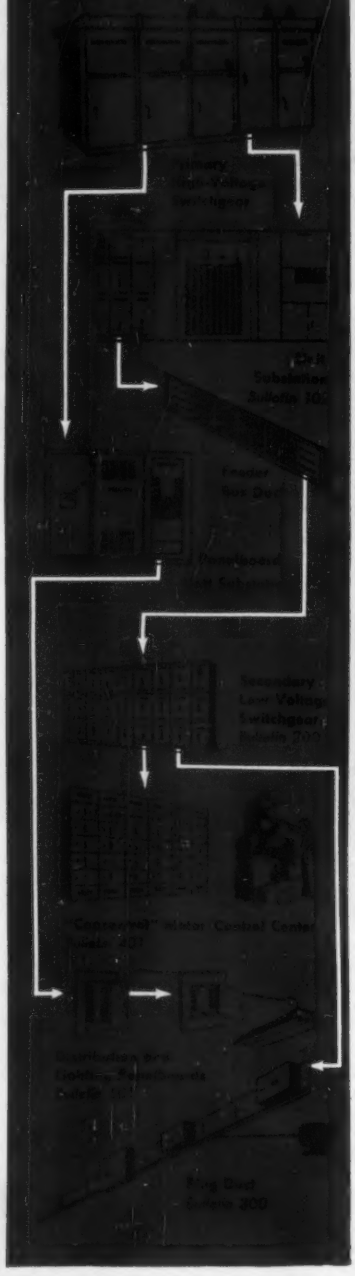
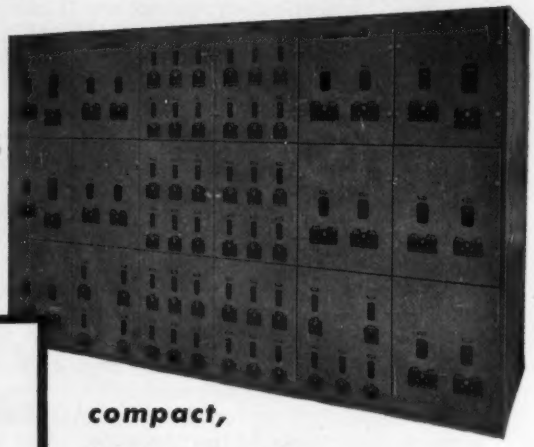


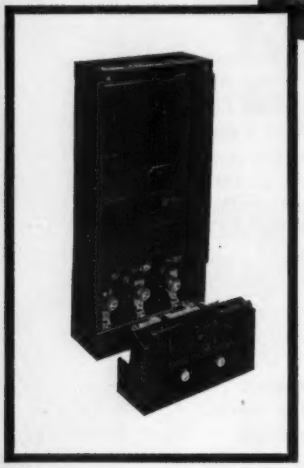
CONTINENTAL Low Voltage

DRAWOUT SWITCHGEAR

featuring

NEW "CORDON" Current Limiting Circuit Breakers





New draw-out "Amp-Trap", unusually compact current limiting fuse, makes combination breaker feasible.

compact, low cost units with 100,000 amp interrupting rating

This CONTINENTAL Low Voltage Switchgear offers attractive initial cost . . . plus a new protective device that solves high magnitude low-voltage short circuit current problem.

"Cordon" current limiting Circuit Breakers provide protection to 100,000 amp. rms interrupting rating, yet save you money. Add this important feature to the safety and economy of rigid, compact CONTINENTAL switchgear . . . the result is low cost, low maintenance equipment protecting you better than ever.

Compare for yourself. Write for detailed specifications today.

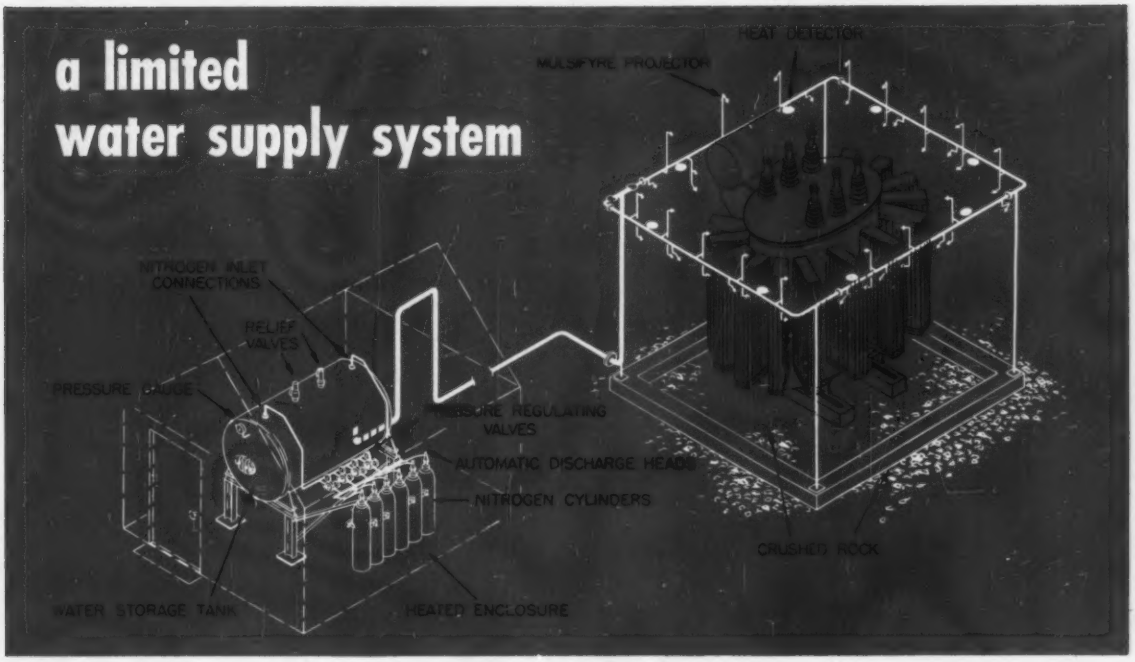
DELIVERY: 6 WEEKS*

CONTINENTAL ELECTRIC EQUIPMENT CO.

219 West 4th Street Cincinnati 2, Ohio

*Standardized units only, not requiring approval drawings. If approval drawings are required, add 2 weeks.

NOW!
Grinnell SELF-CONTAINED Mulsifyre Protection

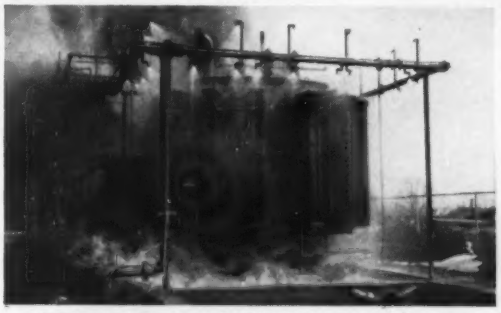


You need no longer be without water spray protection simply because your hazard is distant from city water mains. Grinnell's new *Self-Contained* Mulsifyre System provides automatic detection and prompt water spray protection in extinguishing fires while still small, and in preventing their spread with possibly serious damage.

Water spray protection, of course, presupposes water under pressure. Grinnell's *Self-Contained* System successfully achieves this through the use of nitrogen gas, stored in cylinders under high pressure, which drives the water from the storage tank at spray-forming velocities. As with all Grinnell Fire Protection Systems, the component parts of the Self-Contained Mulsifyre System are fully listed by Underwriters' Laboratories and meet specifications covered in NBFU Standards 13 and 15.

Your particular hazard will be thoroughly analyzed by the Grinnell Fire Protection Division, which introduced water spray protection in America — and has the widest possible background experience in its use. Full consideration will be given to the property to be protected, as well as to all other adjacent exposure hazards.

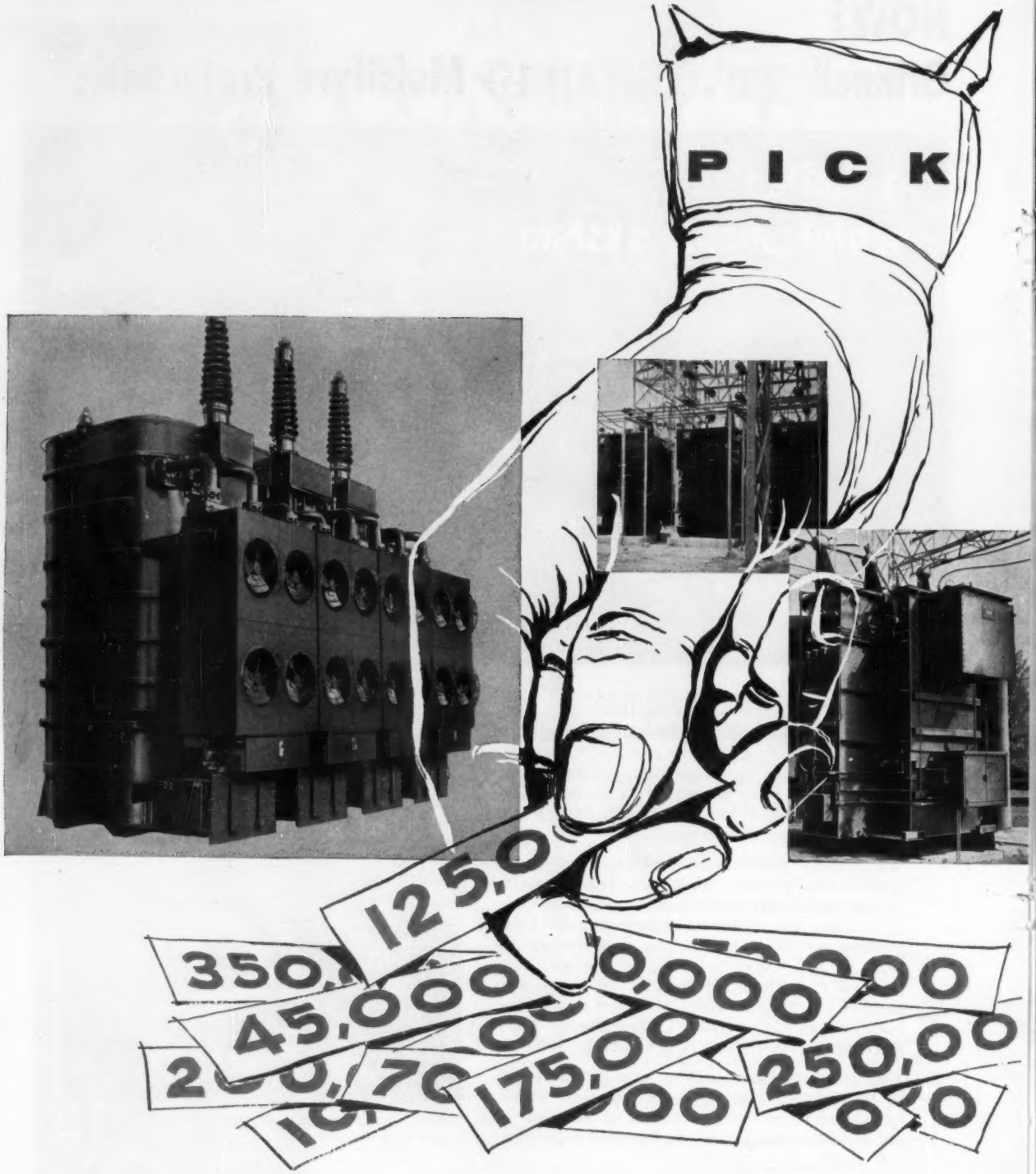
Let a Grinnell Fire Protection Engineer tell you more about this system. Grinnell Company, Inc., 252 West Exchange Street, Providence, Rhode Island. Branch offices in principal cities.



Grinnell *Self-Contained* Mulsifyre System successfully operating to extinguish fire under test conditions

GRINNELL *Mulsifyre*

EMULSION EXTINGUISHMENT OF OIL FIRES



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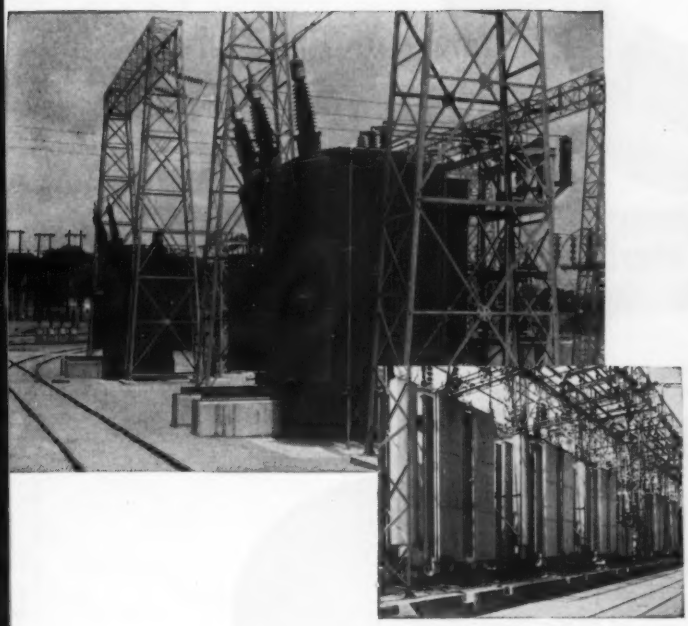

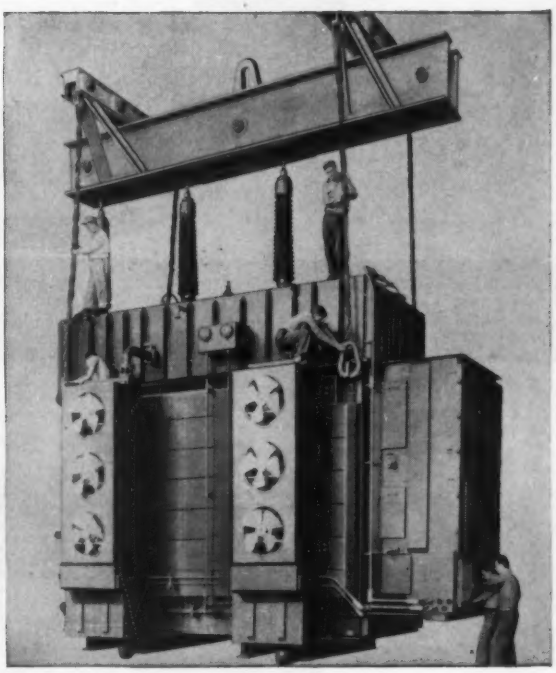

Any number that fits your needs . . . Kva that is, and Moloney can supply it. Regardless of the rating required, Moloney has the engineering experience, the facilities and the capacity to produce the transformers you need.

Of primary importance to utilities is the fact that Moloney Transformers in the field have unequalled operating records. Then too, Moloney engineering is recognized for the ability to solve problems that are unique to particular utility systems. This engineering ability and experience, functioning within the confines of the industry's finest facilities, leads to the production of transformers of any size and rating that are best suited to perform as specified. Add to this Moloney field-proved, revolutionary load tap changing equipment and you have the nucleus around which to build the best transmission and distribution installations.

MES6-26

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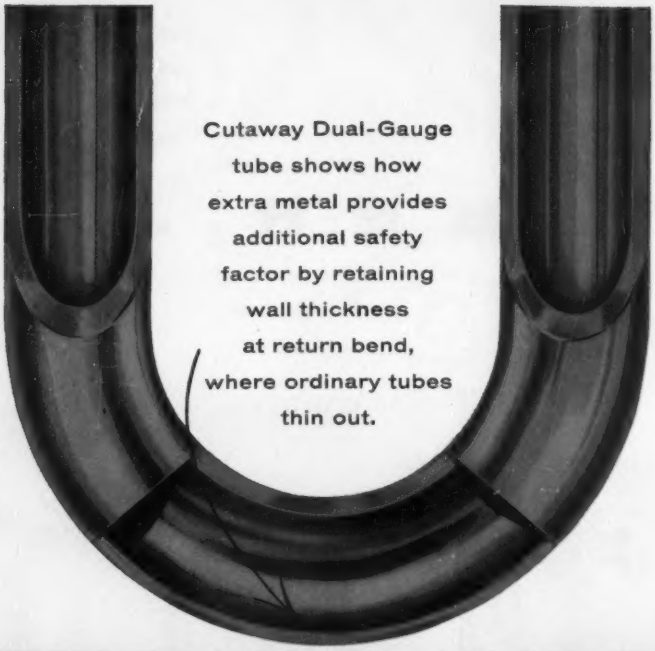
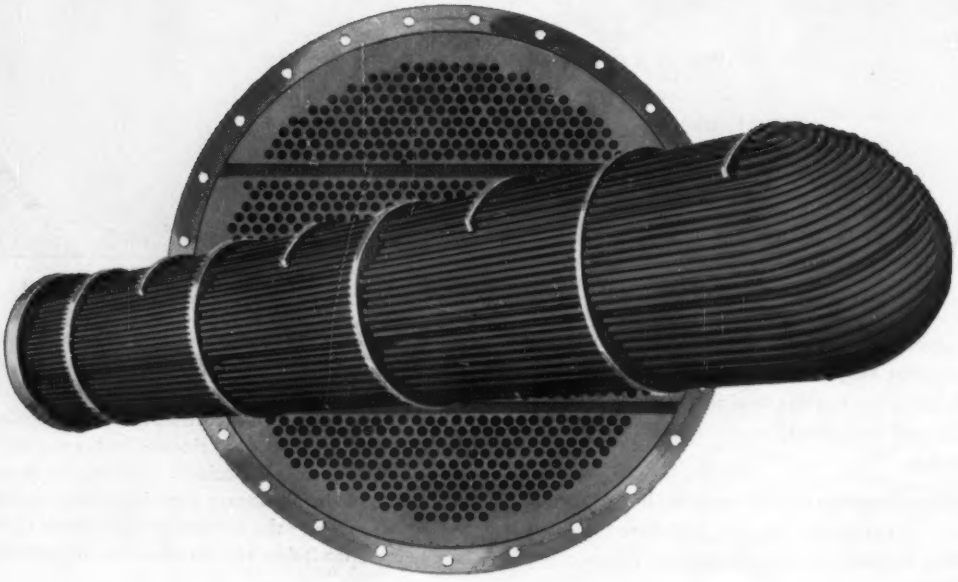


Cutaway Dual-Gauge tube shows how extra metal provides additional safety factor by retaining wall thickness at return bend, where ordinary tubes thin out.

Specify

DUAL-GAUGE



First for Lasting Quality—from Mine to Market!

To keep tubes uniformly strong
in condensers, feed water heaters,
heat exchangers and similar equipment...

PHELPS DODGE

TUBING!

- Provides heavier wall thickness:
  - **a.** At one or more points in tube length to compensate for thinning on outer portions of return bends.
  - **b.** At points of support.
  - **c.** At tube ends to meet special requirements.
- Produced in all standard sizes or manufactured to the particular design requirements of individual customers.
- Available in Cupro-Nickel, Red Brass, Aluminum Brass, Admiralty metal and Muntz metal.

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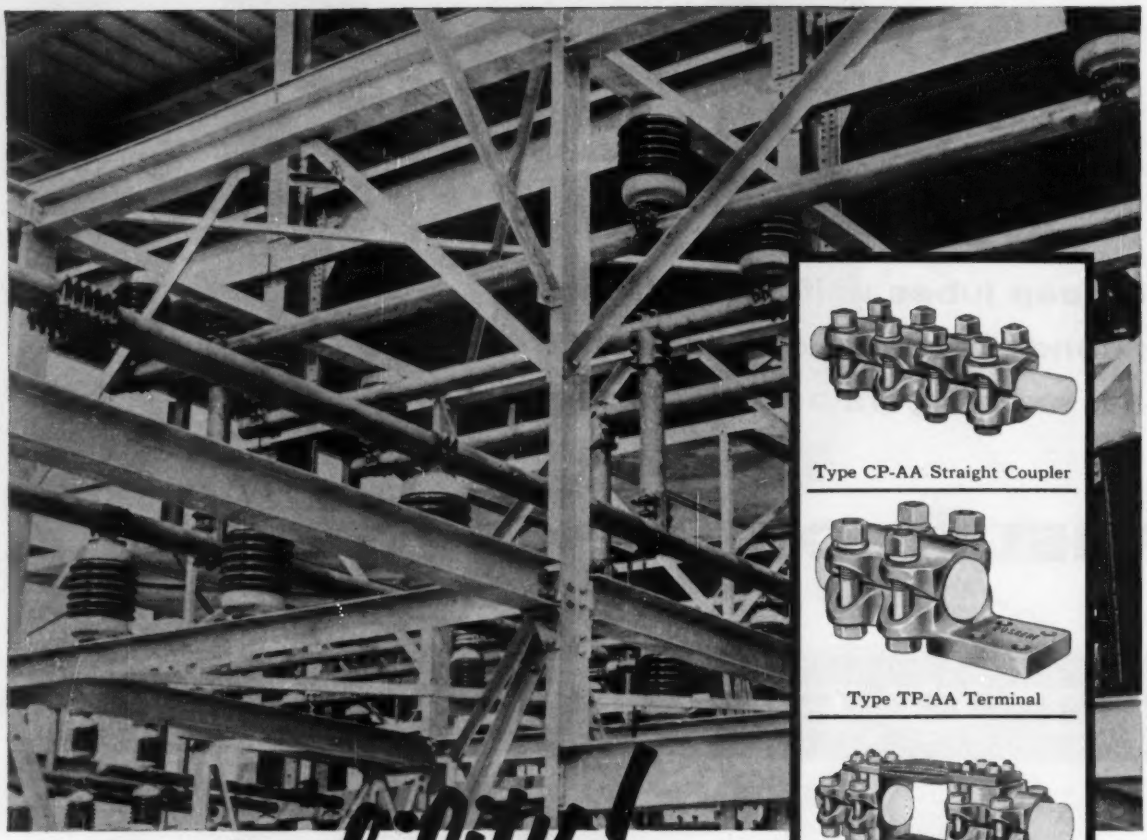


Reliability!

DOSSERT ALUMINUM POWER CONNECTORS

A complete line for substations and generating plants

No single factor is more important in providing reliability of Aluminum connectors than the production of sound aluminum castings with optimum physical properties. These optimum properties provide Dossert Connectors with:

- Greater Corrosion Resistance
- Higher Impact Resistance
- Higher Mechanical Strength
- Greater Conductivity

Incorporation of all these features into Dossert Aluminum Power connectors is made possible by Dossert's own exclusive casting technique. This process was developed after years of experimentation and embodies procedures and controls exceeding aircraft standards. By controlling elements to within close limits, by modifying alloys to put all constituents into complete solution, and by degassing metal to eliminate porosity and internal shrinkage . . . Dossert can offer you a truly reliable connector.

We also welcome inquiries on modifications or applications.

DOSSERT MFG. CORP.

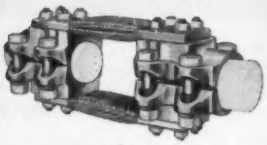
253 Huron Street, Brooklyn 22, N. Y.

Representatives in all principal cities

IN CANADA: W. S. Gerrie & Assoc., Ltd. Toronto

Type CP-AA Straight Coupler

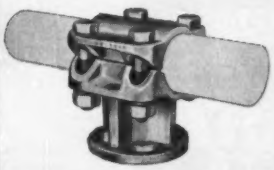
Type TP-AA Terminal



Type XCP-AA
Expansion Coupler

Type BP-AA Tee Connector

Type ULKA-AA Terminal



Type PSS-AA Bus Support

There's more in this barrel for you...

James E. Pratt, left, Socony Mobil engineer, obtains performance data on hydraulic system at an aluminum extrusion plant.

MORE ENGINEERS

to help you improve production and cut costs!

Specify Socony Mobil and get the services of more industrial lubrication engineers than are provided by any other oil company.

These specialists, working closely with your Mobil representative, will help you set up a plant-wide program of correct lubrication . . . advise on any lubrication problems that might arise. Their long experience and expert recommendations can improve your production and cut costs.

Socony Mobil products are also backed by *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* approvals from machine builders . . . *more* continuous research to assure continually improved products . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
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Cable laying

Bath Iron Works' crane loads reel from flatcar to barge.

LOCAL NEWSPAPERS seldom get excited over the laying of a submarine cable. But when Central Maine Power Company announced plans to link the island of Islesboro with a new 12,000-volt underwater cable, newspapers throughout the state covered the event.

The new cable, three inches in diameter and 2.3 miles long, was made in one length with no splices permitted. The cable, reel and cradle weighed *63 tons*, and in the whole area north of Boston there was only

CMP officials check final armoring of cable at mill.

71-year-old "Seguin" stands by ready to help.

CMP crew boards launch during the pre-dawn hours.

makes headlines in Maine

one water-front crane (owned by Bath Iron Works) big enough to load the reel onto its barge. Even the tugboat was newsworthy; it was the venerable "Seguin," one of the oldest tugs on the coast, built in Bath 71 years ago.

The actual cable laying was directed by Al Young, CMP's Eastern Division line superintendent. Under radio control, the barge started off at daybreak to lay the cable in the 220-foot-deep (maximum) water. The laying took only three hours, and the barge reached the far shore at high tide (as calculated), so it could get close to the shore.

The Tiger Brand cable was made up of three No. 2 conductors covered with conducting fabric tape, 21/64 inch of marine rubber insulation, color-coded fabric conducting tape again, then a tinned copper tape that furnishes additional shielding and also protects against the toredo or "ship worm." Saturated jute fillers and a binder of rubber-filled tape complete the core.

Two layers of asphalt-saturated jute are spirally applied in opposite directions, followed by the all-important No. 6 galvanized steel armor wires. A final asphalt coating is applied, then a layer of chalk to prevent sticking.

• • •

If you'd like more information about submarine or any other kind of high quality Tiger Brand cable, just call your American Steel & Wire salesman.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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- mold cured portable cord
- shovel & dredge cable
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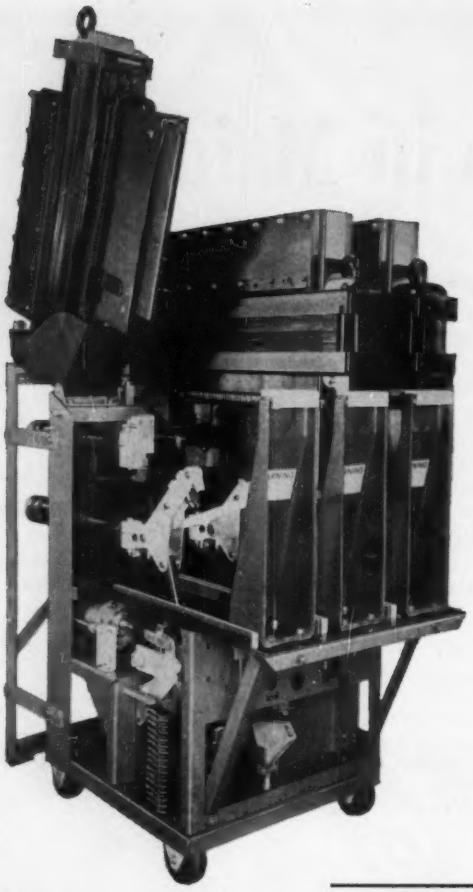
- interlocked armor cable
- special purpose wire & cable
- aerial, underground and submarine cable

UNITED STATES STEEL

USS

Trawler maneuvers barge with reel into position.

End of the line. Cable is trenched, potheads are on pole.



A Complete Line of I-T-E Metal-Clad Circuit Breakers for Every Application

Anticipating the proposed addition of three new higher metal-clad switchgear ratings, I-T-E now has a complete line of circuit breakers which are fully developed and tested to meet every requirement.

New 75 mva interrupting rating for I-T-E metal-clad switchgear applied on 4.16 kv systems

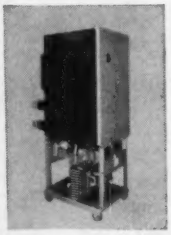
New 350 mva interrupting rating with a new 3000 amp continuous rating for application on 2.3 or 4.16 kv systems

New 750 mva interrupting rating for application on 13.8 kv systems at 1200/2000 amp continuous

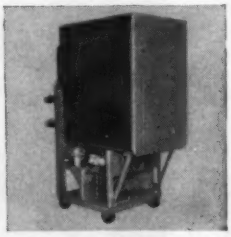
I-T-E Type	Continuous Amperes	Rated KV	Interrupting MVA
5HV-75	**1200**	4.16	**75**
5HV-150	600-1200-2000	4.16	150
5HV-250	1200-2000	4.16	250
5HV-350	**1200-3000**	4.16	**350**
7.5HV-250	1200-2000	7.2	250
7.5HV-500	1200-2000	7.2	500
15HV-150	600-1200	13.8	150
15HV-250	1200-2000	13.8	250
15HV-500	1200-2000	13.8	500
15HV-750	**1200-2000**	13.8	**750**

Note: These ratings require no change in I-T-E compartment dimensions.

5HV-75



5HV-350



15HV-750

For complete information, call your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

ELECTRICAL BUSINESS OUTLOOK

Electrical World
DECEMBER 10, 1956

Corporate income taxes will stay at 52% during 1957. The tip-off on a further delay in tax relief to corporations comes from recent Treasury Department recommendations to Congress. Treasury people asked for another one-year extension of excise tax cuts due April 1. This apparently sounded the death-knell for the scheduled April 1 return to a 47% corporate tax rate. The reason: Increased federal spending for defense and public works, and a continuing business boom that might become dangerously inflationary if buoyed by tax cuts now.

But, barring a major business decline, most officials feel a cut to 47% in the foreseeable future is optimistic. A drop to 50% is more likely considering the rising cost of government and pressure by both parties to give individuals some sort of tax reduction. Whether individual tax cuts will come next year or later is still a moot question.

Even a 2% reduction in taxes would bolster electric utilities net by roughly $45 million in 1956. That's not much out of the $1.1 billion private utilities will pay in federal income taxes this year. But cumulatively it could help to ease the industry's growing pains in years to come.

• • •

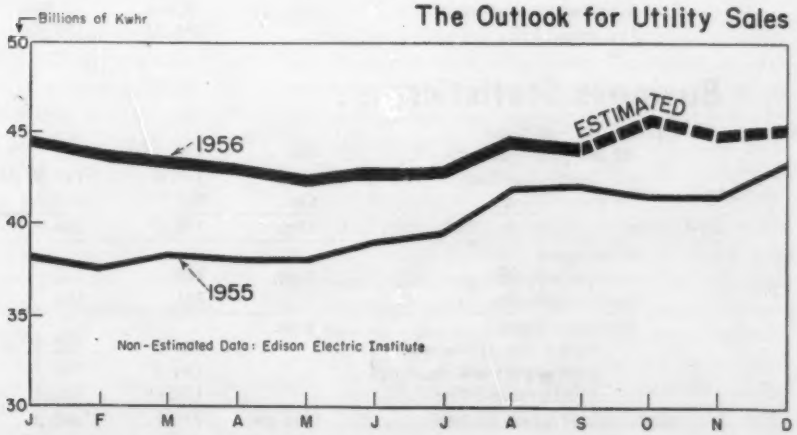
Metal prices in the near future won't be the inflationary pace setters they've been most of this year. With the exception of steel, supply of many metals has apparently caught up with demand forcing prices to hold or even back down.

Aluminum will continue plentiful. Prices haven't declined—and probably won't. But there is a temporary oversupply which will keep a lid on prices at least through the early part of '57.

Custom copper smelters provided a further clue to at least near term price trends for this metal. Only recently the custom people cut prices for January delivery to 35½¢—½¢ under major copper producers and custom smelter quotations for December delivery.

Lead and zinc prices may slip lower next year. H. Danforth Starr, vice president and treasurer of Cerro de Pasco, feels there is this possibility. Government stockpiling will be the deciding factor. Without this prop there's a good chance that prices would ease lower.

The Outlook for Utility Sales



STATISTICS

Top Steam Plant Operated at 9,110 BTU per Kwhr in 1955

Plant	Operator	Installed Capacity Kw	Peak Demand Kw	Plant Factor % (a)	Btu per Kwhr	Employees Av'g Number	Employees Per 1000 Kw Cap
Kyger Creek	Ohio Valley El Corp	900,000	1,094,000	(b)	9,110	290	0.32
Clifty Creek	Ind-Ky Elec Corp	900,000	1,126,000	(b)	9,143	325	0.36
Kanawha River	Appalachian El Pr Co	351,500	455,000	105	9,151	126	0.36
St Clair	Detroit Edison Co	625,000	648,000	75	9,220	169	0.27
Muskingum	Ohio Power Co	351,500	451,000	101	9,234	148	0.42
Tanners Creek	Ind & Mich Elec Co	425,800	549,900	101	9,273	188	0.44
Eastlake	Cleve Elec Ill Co	300,000	412,000	103	9,336	118	0.39
Philip Sporn	Appal El Pr-Ohio Pr	500,000	613,000	88	9,341	255	0.51
Shawville	Penna Elec Co	265,000	268,000	85	9,368	78	0.29
Albany	Niagara Mohawk Pr	320,000	393,000	83	9,373	129	0.40

Notes: (a) Ratio of total net generation to plant capacity multiplied by 8,760 hrs.
(b) Not reported.

Source: Federal Power Commission

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Sept.	118.66	118.01	110.91	7.0
Peak—Class I Systems (million kw)	Sept.	96.5	98.0	90.1	7.1
Estimated Dec. '56 Peak	Sept.	106.17	106.10	104.31	1.8
Production—billion kwhr	Sept.	48.82	52.19	46.33	5.4
Hydro		8.96	9.54	8.18	9.5
Fuel		39.86	42.66	38.18	4.4
Sales—billion kwhr	Sept.	46.07	46.11	43.39	6.2
Residential		11.68	11.60	10.63	9.9
Commercial		7.82	7.95	7.36	6.3
Industrial		23.86	23.78	22.72	5.0
Other		2.72	2.78	2.68	1.5
Fuel Consumption	Sept.				
Coal—million tons		12.45	13.18	12.07	3.1
Oil—million barrels		5.20	5.18	5.18	0.4
Gas—million cu ft		124.63	142.04	119.85	4.0
Net Income Class A & B Co's—$ million	Sept.	108.45	97.17	100.18	8.3
Residential Customers—millions	12 mos.	45.25	45.10	43.95	3.0
Revenue per kwhr	ended	2.61¢	2.61¢	2.66¢	− 1.9
Avg kwhr per customer	Aug. 31	2,914	2,899	2,682	8.7
Avg annual bill		$76.06	$75.66	$71.34	6.6

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Oct.	150	145	147	2.0
ENR Construction Cost	Nov.	147.6	147.6	141.1	4.6
BLS Cost-of-living	Oct.	117.7	117.1	114.9	2.4
New Orders for Machinery (1950 = 100)	Oct.	137.0	136.0	130.0	5.4
NEMA Sales					
Insulation materials	Sept.	147	153	156	− 5.8
Electric appliances		101	100	114	−11.4
Wholesale prices	Sept.				
Motors and generators		136.2	133.3	125.1	8.9
Transformers and regulators		144.8	139.7	129.2	12.1
Switchgear and fuses		157.0	153.8	146.1	7.5
GNP—annual rate— $ billion	3rd Qtr.	413.8	408.3	396.8	4.3

Your Business

National Electrical Week (next Feb. 10-16) reminds us that there are over 300 business promotion events, legal holidays, and religious observances to be celebrated next year. Of course with the crowded schedule, the industry can't expect to have the week all to itself. It will be sharing it with National Advertising Week, National Beauty Salon Week, yes and National Crime Prevention week.

You'll find all the special days, weeks and months for 1957 listed in a handy little 48-page booklet just released by the Chamber of Commerce of the United States. Send 50¢ to the Chamber, 1615 H. St, Washington 6, D. C., for a copy.

What did he say? A spinster, shocked at the language the linemen used while repairing a line near her home, protested to company officials. The foreman was immediately directed to make a report on the conduct of his crew. Gist of report follows: "Me and Spike were on this job. I was up on the pole and let the hot lead fall on Spike—right down his neck. Spike looked up at me and said: 'Really, Harry, you MUST be more careful.'"

"Very fine looking diploma . . . nice paper. Now how many years of actual experience did you say you had in the field of engineering?"

Your Health — Athlete's Foot

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

The country club shower, the swimming pool, the factory shower room and, perhaps most of all, the family bathtub all are sources for that common skin affliction—ringworm infection. The most frequent site of this fungus infection is the feet, especially between the toes. It is then called athlete's foot.

The disease is spread by infected persons. An individual with ringworm of the feet walks barefoot across a floor or in a wet shower or tub and the area is infected. Then, along comes someone else barefoot and he, too, is infected.

There is some question as to whether anyone ever really gets over athlete's foot. Some think you have it in a dormant state until some activating force comes along and causes it to flare up. A moderate case of ringworm offers a fine place for other organisms to settle and create a full-blown infection.

Usually the disease is more of a nuisance than it is disabling. Sores between the toes, itching, moist scaling of the skin are common symptoms. It is only when acute inflammation occurs that the patient is in trouble. During the acute infection stage your physician will prescribe bed rest, and medicated wet dressings are indicated. Sometimes it is necessary to open the blisters. Frequently x-ray therapy is given to the infected area.

Allergic manifestations such as small blebs may appear on other parts of the body during an acute ringworm infection. These disappear as the primary disease subsides.

Ointments or lotions are usually massaged into the infected areas at night and medicated powder rubbed on in the morning. Patients should sterilize their shoes with formalin vapor or direct sunlight. Socks and towels should be boiled. The tub and bathroom floor should be washed with bichloride of mercury or creosol. Disposable bath slippers are helpful.

Do not pick an infected area with your fingers or you will get the fungus under your nails.

Most important of all is how to protect yourself against athlete's foot. The using of a talcum powder containing thymol after bathing is recommended. Dry well. Keep your nails trimmed. Remove any loose or dry or horny skin. Foot deformities such as flat feet or hammer toes should be corrected. If your feet have a tendency to perspire easily, consult your physician for treatment. Wear well-ventilated shoes in warm weather. Medicated foot baths and sprays are of doubtful preventive value. Keeping the shower floors dry and clean is a must.

Infecting microbes of all sorts are everywhere—at work, at home or at play. Nothing beats good body hygiene for keeping healthy. Be wise and be clean, and be sure to dry well between your toes.

WASHINGTON COMMENT

Fight Shaping Up on TVA Board Appointment

V. CRAIG RICHTER, Washington Correspondent

A deadlock in Congress may be shaping up over the composition of the Tennessee Valley Authority's Board of Directors.

This situation is expected to come to a head next May on the expiration of the term of Dr Harry Curtis, a Truman Administration appointee. The board now consists of Curtis, Chairman Herbert D. Vogel, appointed by President Eisenhower, and another Truman appointee, Dr Raymond Paty.

The fight will boil down to this:

Will Eisenhower nominate a man who sees eye-to-eye with his man Vogel?

Since the Senate has to approve, and the Democrats now control the Senate, any such nominee is sure to be given a rough time and may possibly be denied confirmation. Meanwhile, Vogel and Paty, already in disagreement, would almost certainly create a deadlock. Curtis leaves his office May 18, even though his successor is not confirmed.

Appointee Will Get Close Scrutiny

A number of Senators from the South already have served notice they will "thoroughly investigate the background" of any nominee for the vacancy. In view of the ideological conflicts involved, the chances appear to be slim for finding a replacement who will satisfy both Southern Democrats and Vogel.

Reports of a new squabble between Vogel on the one hand and Curtis and Paty on the other, is only the latest of a series of controversies on the board. In the latest argument, Vogel is opposing the Curtis-Paty approved proposal to move TVA's agricultural staff from Knoxville to Muscle Shoals.

In opposing the move, Vogel said that it could not be made before next summer by which time, he said, the membership of the board will have changed.

Vogel's opponents immediately took this to mean that a replacement would be found for Curtis who would be sure to agree with Vogel—thus making Vogel's views the majority view.

Vogel has been at odds with Curtis and Paty on administration as well as policy decisions ever since the Dixon-Yates contract. Some board meetings are said to have ended in lively desk-pounding sessions.

Some months ago Vogel is reported to have urged that Eisenhower fire Curtis, citing as a precedent Roosevelt's dumping of Arthur E. Morgan from the board in the early thirties. The Administration vetoed the idea because of anticipated repercussions in Congress.

Vogel to Choose Curtis Successor

With Curtis' term now nearly over, Vogel is almost certain to be allowed by the Administration to pick a successor to assure his control of TVA.

Senators Hill, Sparkman, and Kefauver (D-Tenn.) have served notice that they will look closely at any nominee's background and views on TVA and public power. Further, the Senate Public Works Committee which will conduct hearings on the nomination is composed of a number of pro-TVA Democrats including Sens Albert Gore (Tenn.), Robert S. Kerr, (Okla.), Richard L. Neuberger (Ore.), Dennis Chavez (N.M.), and Pat McNamara (Mich.). Therefore, any Vogel nominee is going to face rough going.

Vogel and the White House, however, are expected to make a strong appeal for solid Republican backing which along with the half-dozen or so anti-TVA Democrats in the Senate may win confirmation. The fight probably will rival that which raged over the confirmation of David E. Lillienthal as chairman of the board over the vigorous opposition of the late Sen McKellar.

TECHNICAL NOTES

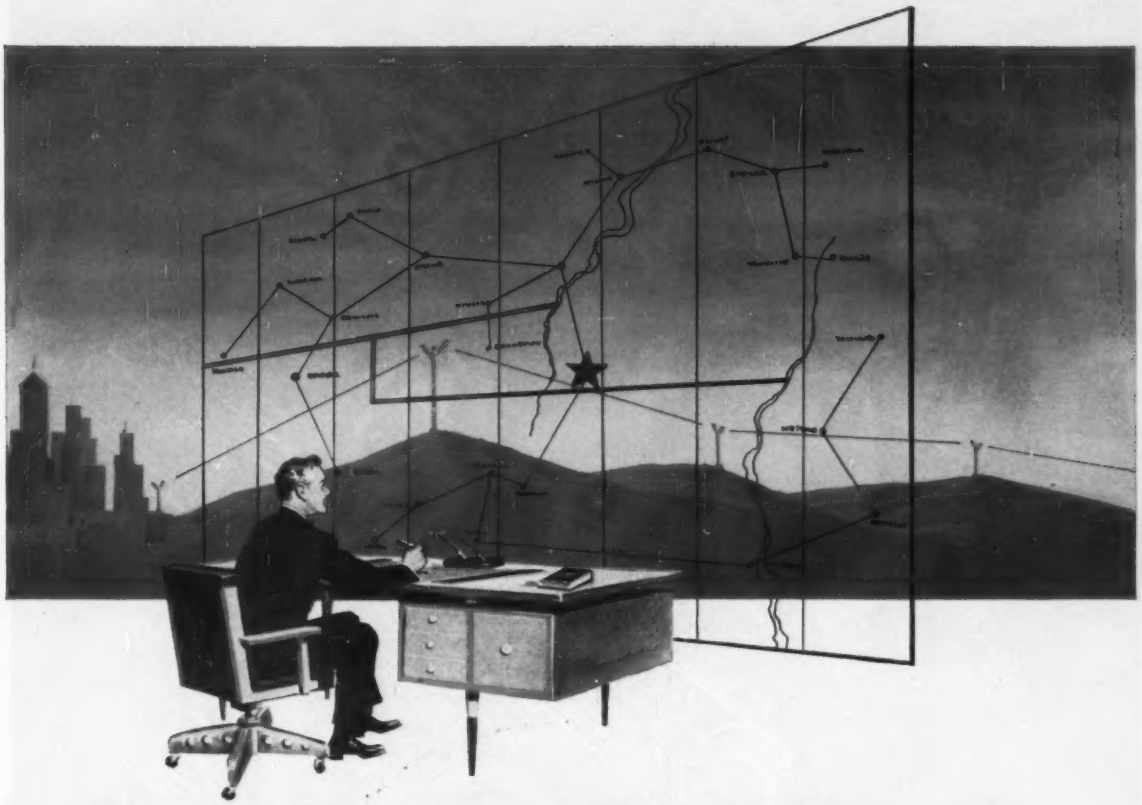
Winch control lever marking plate installed on the floor of the truckcab enables Central Maine Power Co operators to determine quickly the exact position of the lever at any time.

General corrosion in boiler tubes results from a pH of 7.0 or lower. Pitting is usually associated with dissolved oxygen although low pH may greatly accelerate it.

Failure to identify compression dies with wire size leads to faulty compression joints on copper and aluminum alike.

Buried cable may be crushed by a severe lightning stroke dissipating in the earth around it.

Uranium metal is chemically very reactive and incompatible with most coolants.



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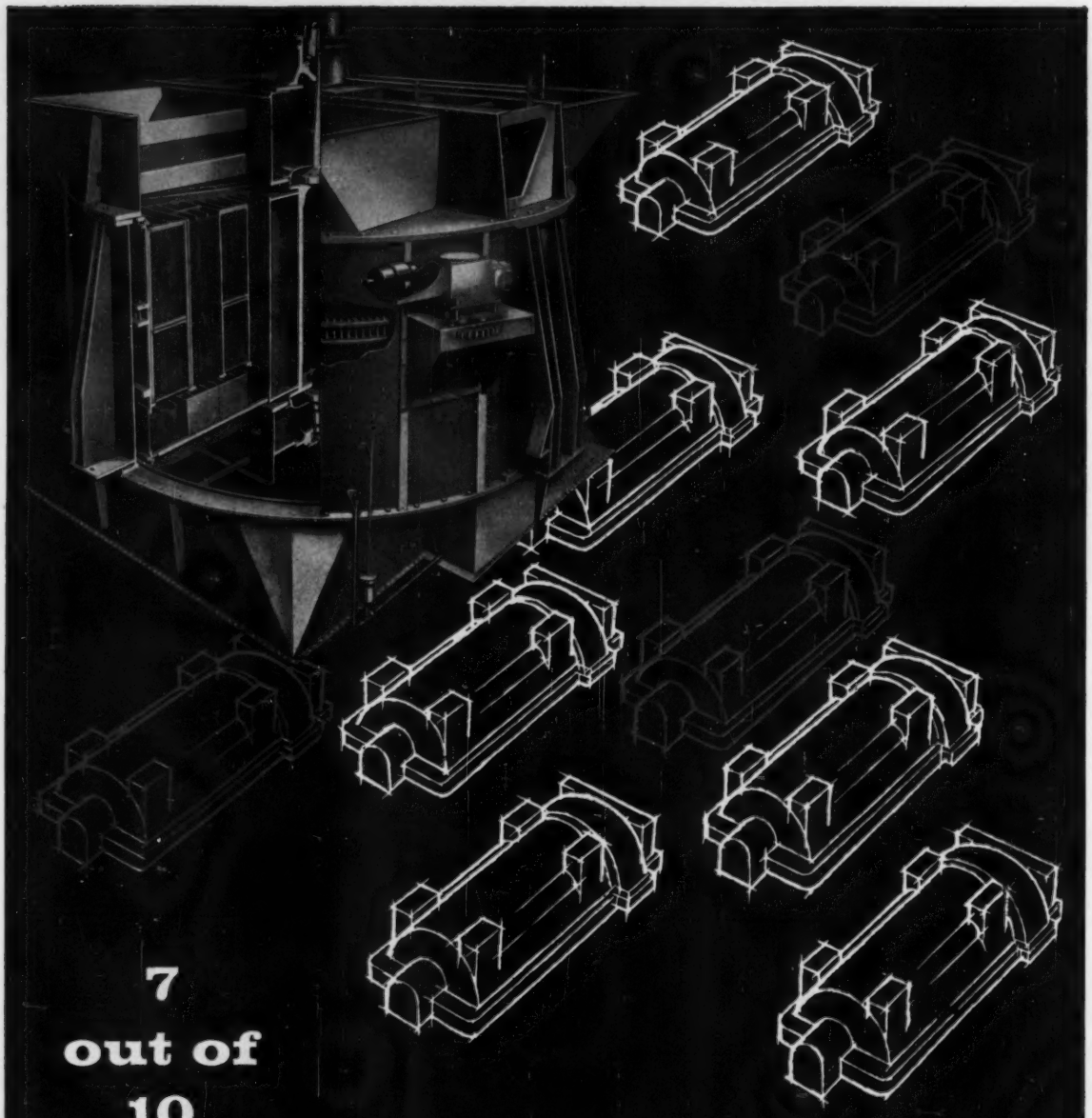

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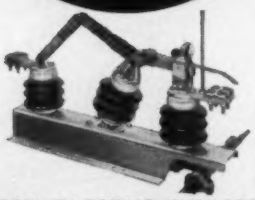
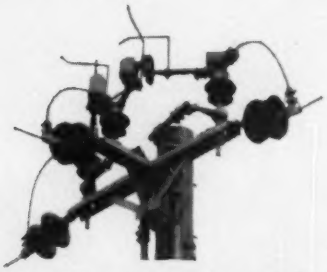
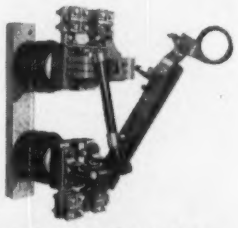


KEARNEY TILTING INSULATOR GROUP OPERATED SWITCH



KEARNEY THREE-POINT SWITCH



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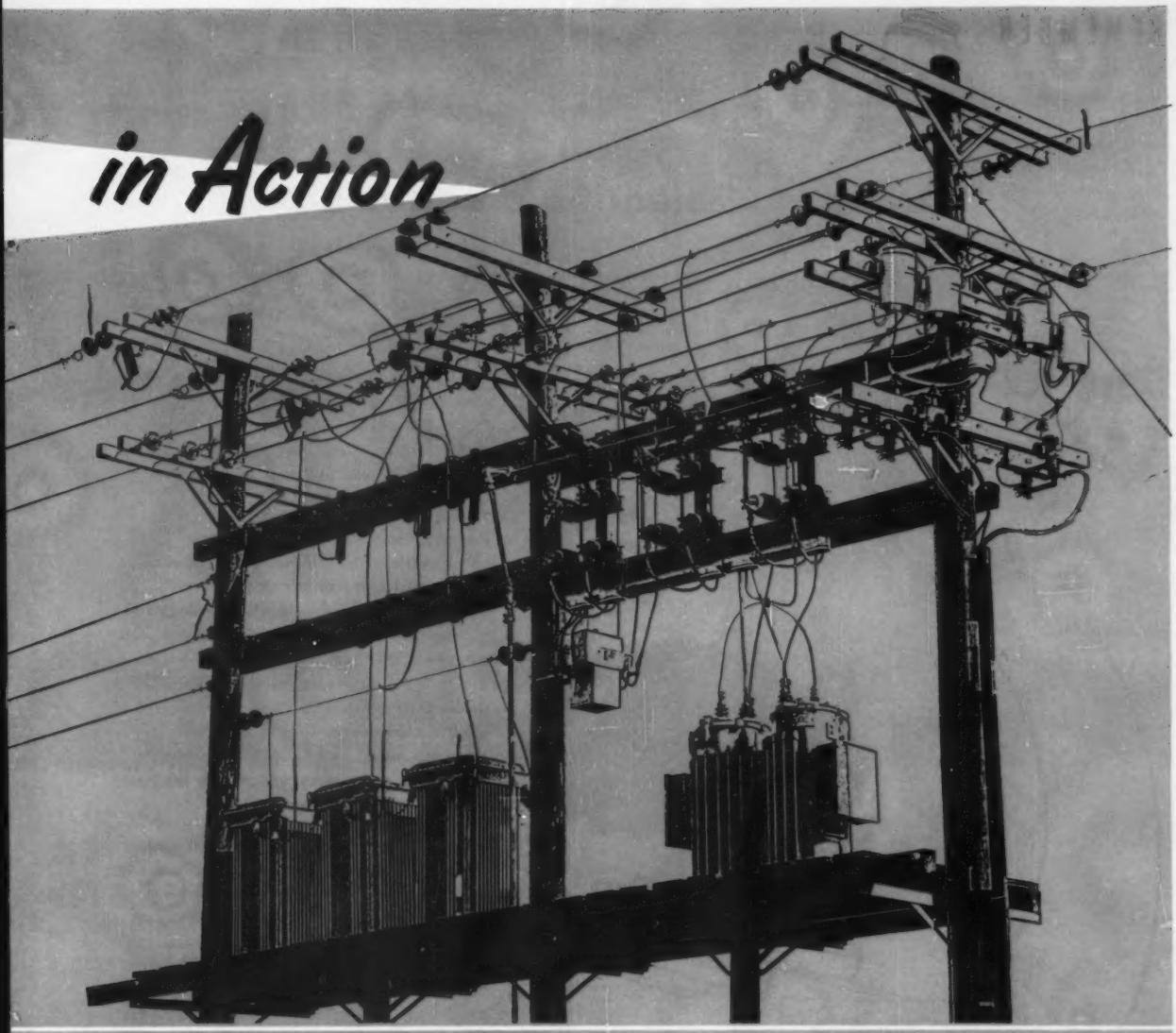

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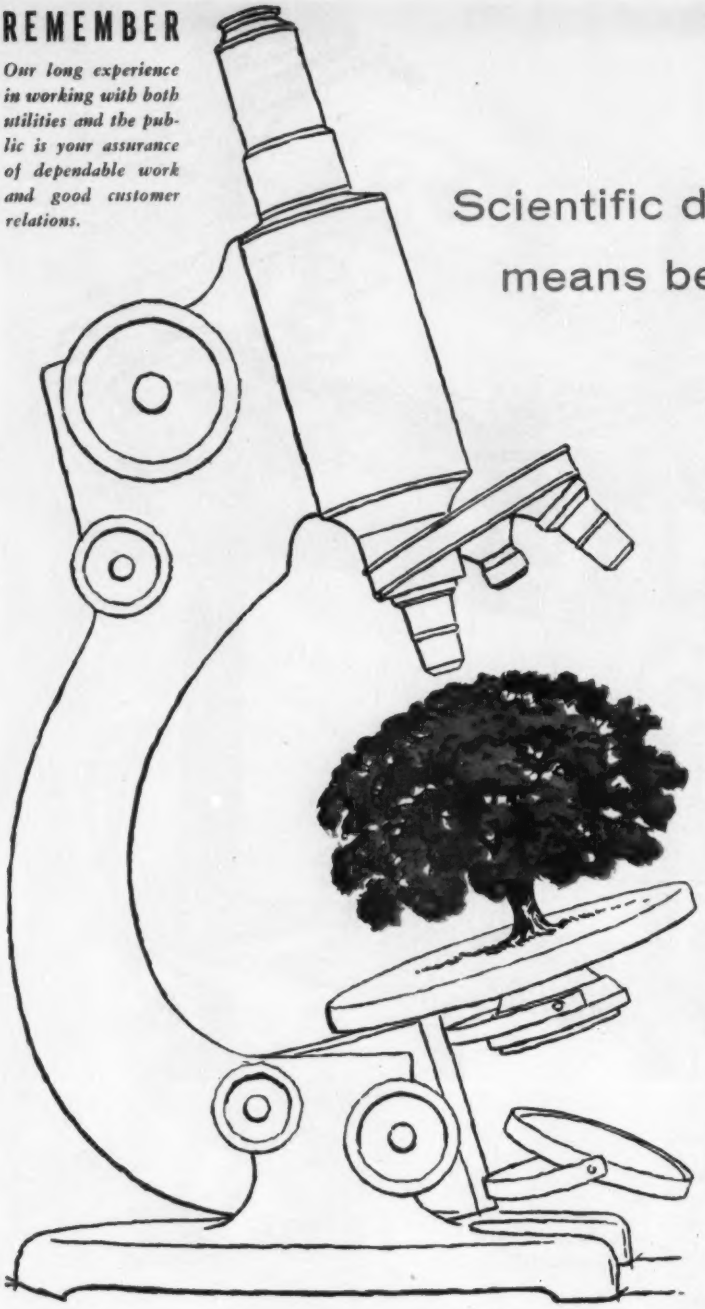

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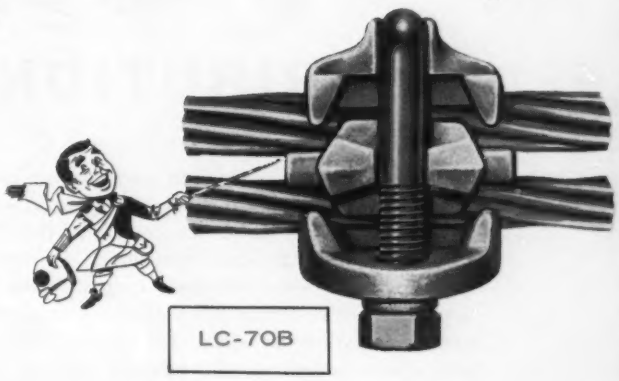

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In December of 1753, Major Washington and his guide, Christopher Gist, were returning to Virginia after having delivered a message to a fort near present-day Erie, Pa. The two men built a log raft on which they attempted to cross the Allegheny River at a point several miles above where that river joins the Monongahela River to form the mighty Ohio. Their raft upset in midstream, but the two men were able to swim to an island, where they spent the night before making a second, successful attempt to cross the stream.

IF GEORGE WASHINGTON CROSSED THE ALLEGHENY RIVER

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DISTRIBUTION TRANSFORMERS

It has been over two hundred years since George Washington — who was then a major in the Virginia Militia — made his near-fatal crossing of the Allegheny River, at what is now Pittsburgh. If Washington were to cross the Allegheny tonight, using the Washington Crossing Bridge that now occupies the site of his earlier drenching, his approach to that span would be lighted with power from Pole Star distribution transformers.

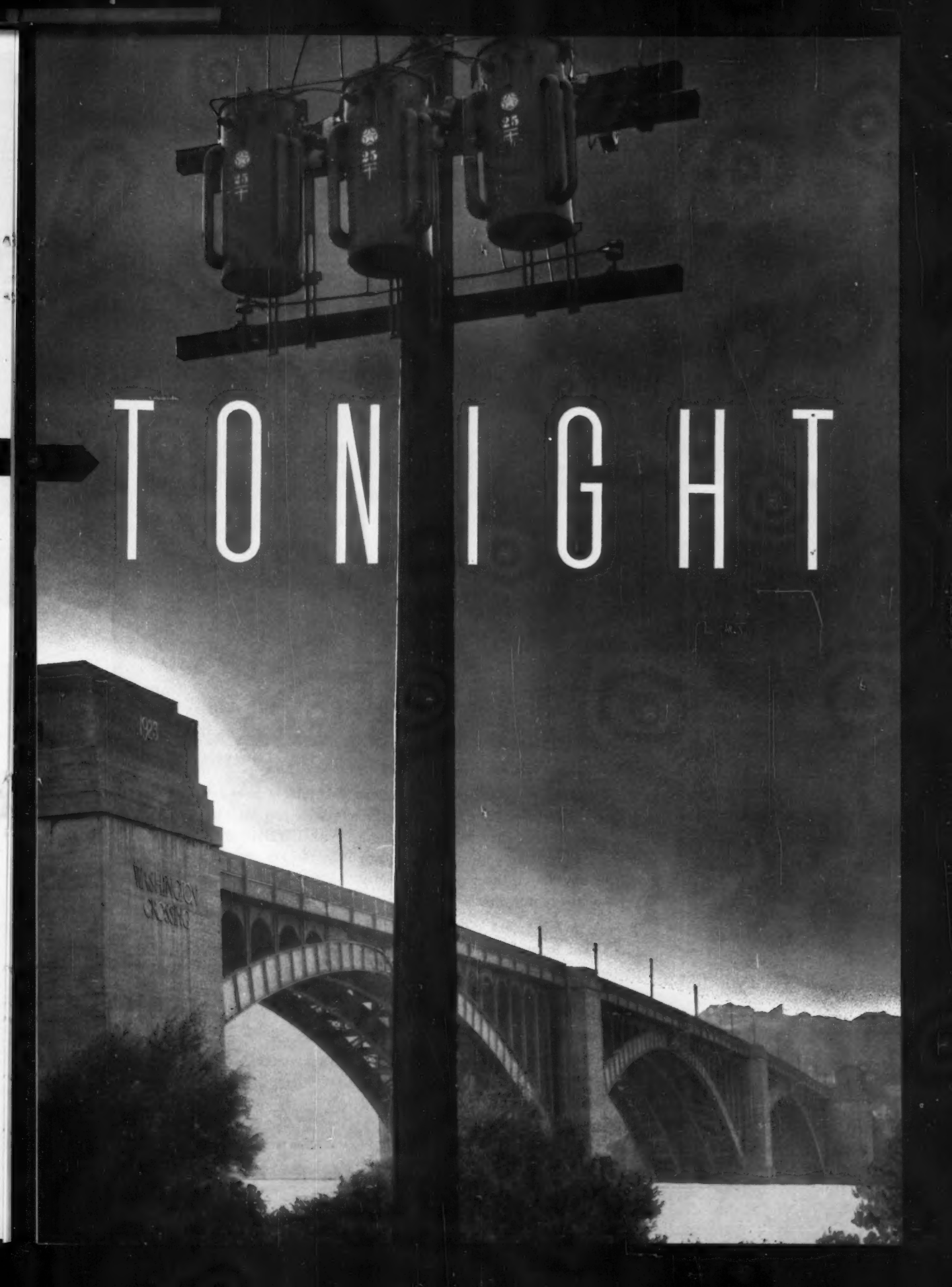
In fact, just about anywhere in the country that Washington might travel — and in this day and age he probably would explore most of it — he would be passing through areas in which Pole Stars serve as important links in electrical distribution systems. This widespread acceptance of Pole Star distribution transformers has taken place in the short period of only ten years — convincing proof that the Pole Star design, with the patented lap-on-top core, "has what it takes" for dependable, efficient service.

Pole Stars are available in all single phase distribution sizes from 3 through 500 kva, in voltages through 67,000 volts; Protected Pole Stars, from 3 through 100 kva, in voltages through 14,400 volts.

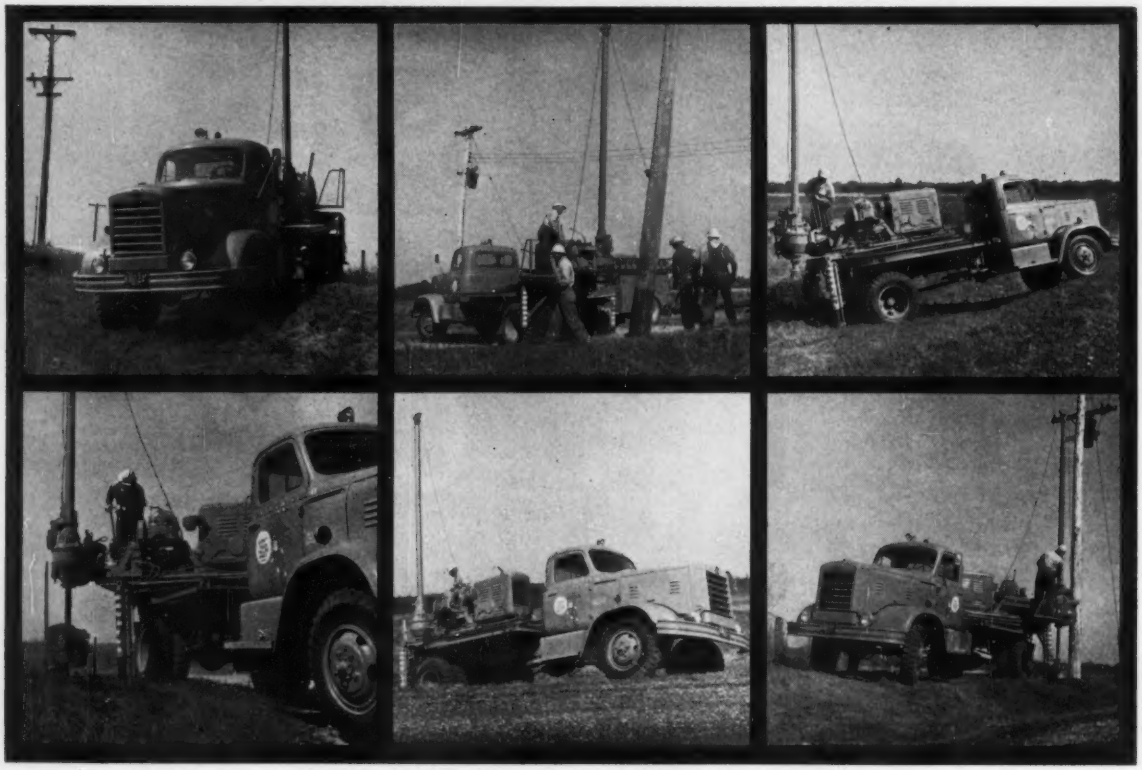
POLE STAR pt

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*


TONIGHT

FWD doesn't skip the tough jobs ...works anywhere in any weather



When the shortest distance between two pole jobs is cross-country . . . you need FWD! New FWDs save time because you don't have to look for the level, easy way to get there. With FWD's unmatched power and traction you can travel straight to the job and do it, no matter how tough the terrain or weather. FWD is the only truck that is ready for line trouble emergencies—anywhere, anytime!

There's an important difference built into FWDs. They have full time, *true* four or six-wheel drive with both power *and* weight proportioned to each driving axle. This is the only way you are assured that every pound of weight is utilized to produce the kind of tractive power that doesn't skip the tough jobs . . . works anywhere in any weather!

FWD

Heavy-Duty Vehicle Specialists

THE FOUR WHEEL DRIVE AUTO COMPANY · **Clintonville, Wisconsin** · *Canadian Factory* · Kitchener, Ontario

70% STRONGER IN COMPRESSION
1000% MORE RESILIENT
30% LIGHTER

New Westinghouse reactor rated a hands-down winner

Remarkable Westinghouse polyester-glass is stronger, more resilient, more versatile by far than any material ever before used in reactor cleat construction. Stronger, less bulky, and with greater dielectric strength, for instance, than conventional concrete. Cleats are bonded into solid vertical columns by high-strength resin tie rods, another Westinghouse innovation. Equally serviceable indoors or out, polyester-glass is impervious to moisture or any other atmosphere condition. In short . . . damage, aging and therefore maintenance are all but eliminated.

All facts. Tough facts, too, but look what current-limiting reactors have to put up with. Forces generated by short circuits and by expansion and contraction of conductors under heavy overloads subject equipment to terrific thermal and mechanical shock.

In the battle of the short circuits the new Westinghouse dry-type reactor is a hands-down winner. For more facts, get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70774-X

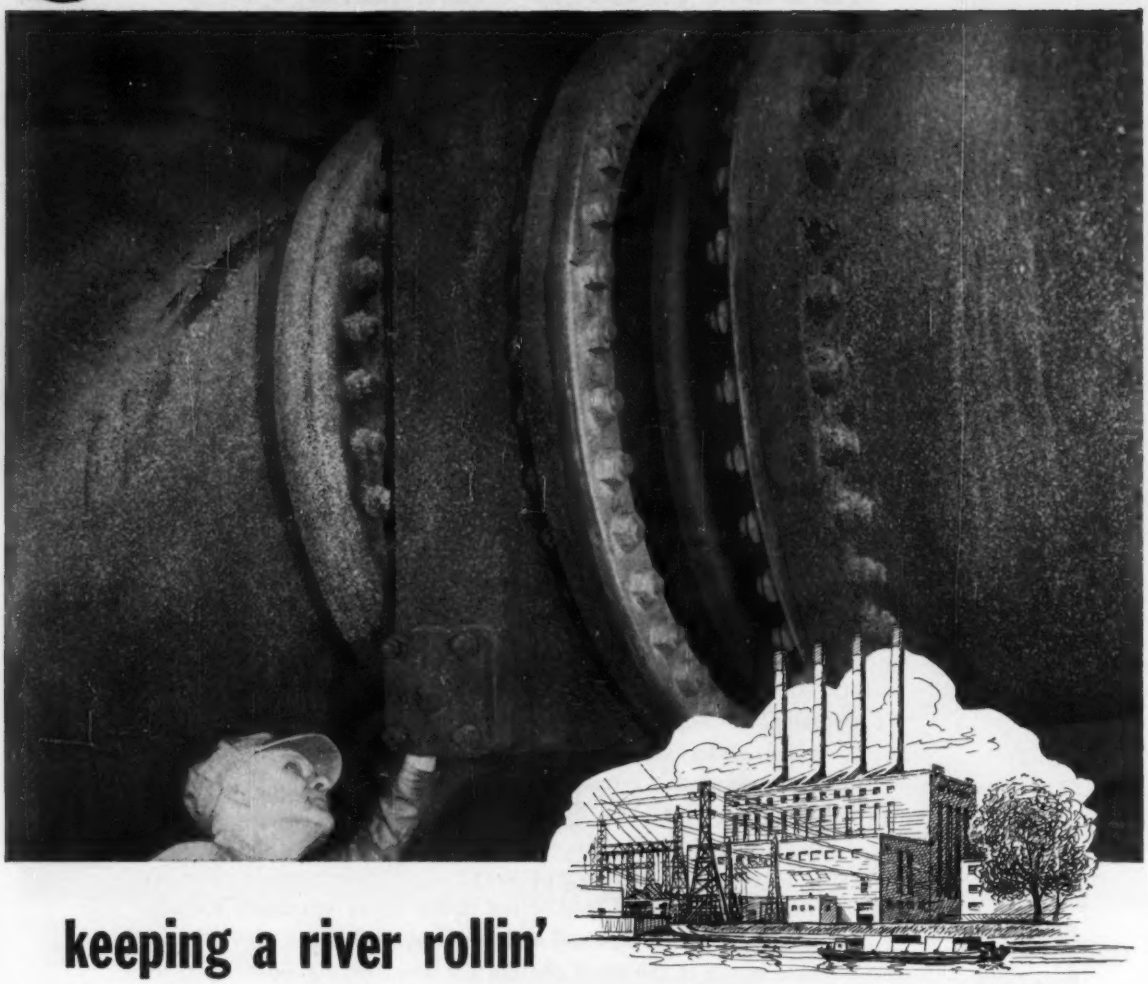
The six columns of a typical Westinghouse reactor have the compressive strength to support the weight of the largest power transformer ever built . . . 365,000 lbs.

WATCH WESTINGHOUSE!

WHERE BIG THINGS ARE HAPPENING FOR YOU!

US RUBBER

EXPANSION JOINTS



keeping a river rollin' and the pipes from rockin'

A river of 390,000 gallons of water per minute rolls through the four surface condensers in Niagara Mohawk Power's plant at Oswego, New York. Here is generated enough power to heat 384,000 household steam irons every hour. Ravenous furnaces consume 3600 tons of coal every 24 hours at full load.

The piping in Niagara's condenser system can't rock or rattle itself to death despite the tremendous capacities and pressures encountered. U. S. Rubber Expansion Joints are the flexible connections that allow the pipes to give and take, to literally ride with the punch.

"These Expansion Joints were installed in 1940," says the plant superintendent, "and they've never given us trouble. We use them in sizes from as small as 6" all the way up to 48", and at water temperatures up to 170 degrees Fahrenheit. We know we will get many more years' wear out of them."

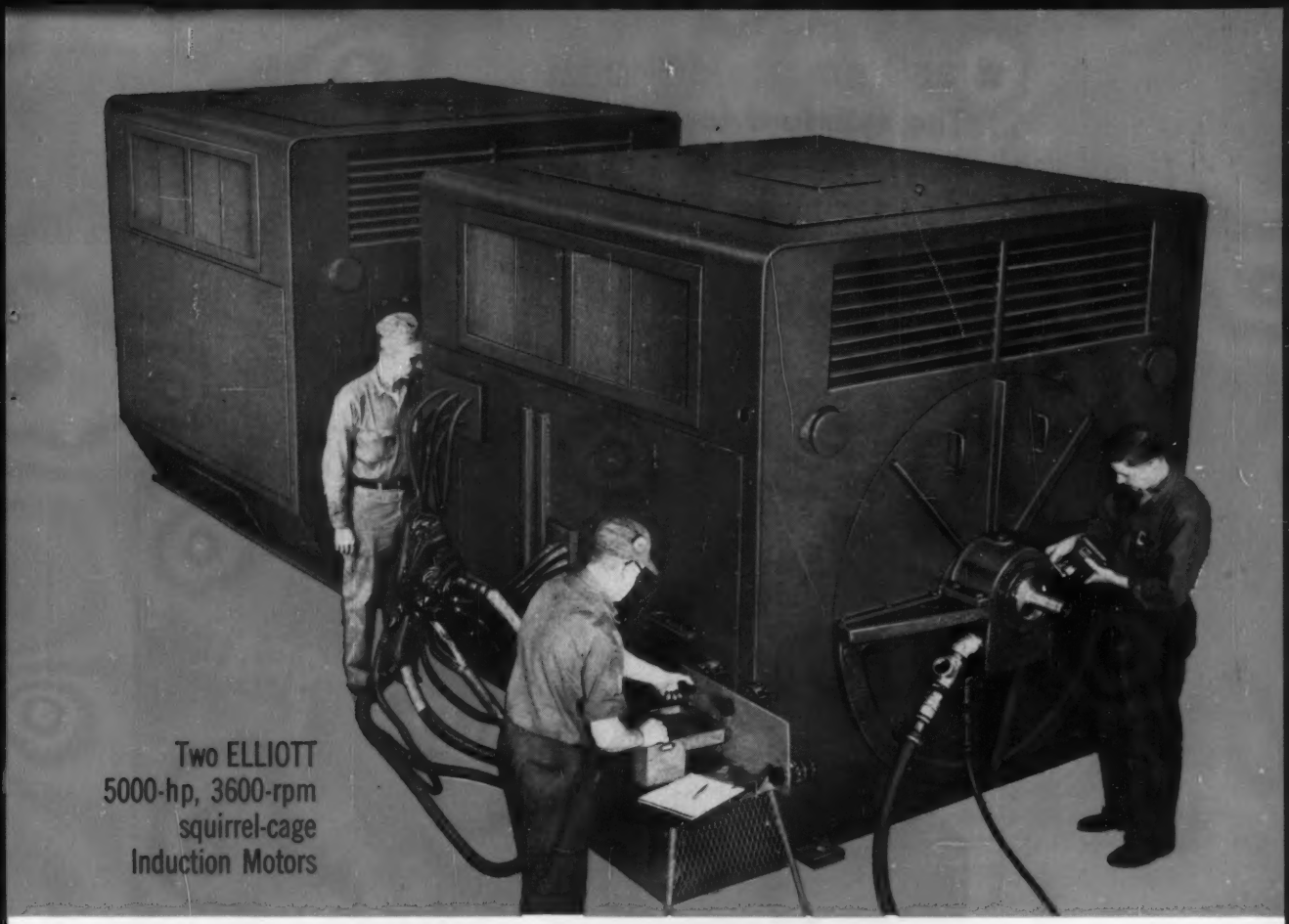
To absorb excess stresses due to expansion and contraction, to insulate against vibration, take care of misalignment, specify U. S. Expansion Joints. They are available at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Watch NCAA football, Saturday afternoons, NBC-TV

US RUBBER

Mechanical Goods Division

United States Rubber



Two ELLIOTT
5000-hp, 3600-rpm
squirrel-cage
Induction Motors

Full-load tests confirm the excellent design of

INDUSTRY'S LARGEST 2-POLE INDUCTION MOTORS

The completion of industry's largest two-pole induction motors marks another achievement of the Elliott Company. This is a field in which the Elliott Company has maintained consistent leadership since the first large 2-pole induction motor was built in 1916.

The building of these motors was made possible by extensive previous experience; now the excellence of their design is confirmed by full-load tests. Data obtained in these tests also provide the information needed to insure the success of larger motors yet to come.

The boiler-feed pump motors shown above are the latest Elliott "Super-Quiet" construction, designed to lead the way to lower sound levels demanded by noise-conscious industry today.

Send for a copy of our new booklet, "Milestones," which gives more information about these machines. Address Elliott Company, Ridgway, Pa.

If you have not already seen these motors you are invited to attend the demonstration now being conducted at Ridgway.

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS
CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

B6-28

The standard for splicing economy

GOLD SEAL RUBBER TAPE

For top value . . . in any type . . . get

JENKINS *Gold Seal Tape*

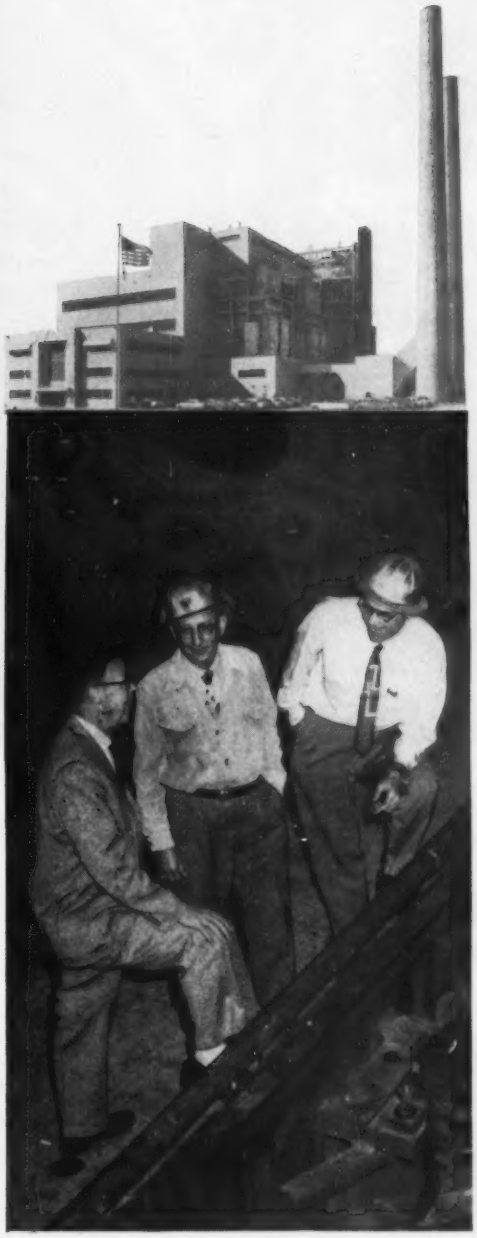
FRICTION • RUBBER • PLASTIC

BEST BUY FOR PLANT SUPPLY

All types of **GOLD SEAL TAPE** are packed in 10-roll cartons as well as single rolls. Every roll cellophane-protected, stays fresh. Jenkins Bros., Rubber Division, 100 Park Ave., New York 17. **DIAMOND SEAL** Friction and Rubber Tape are also made by Jenkins Bros. to ASTM specifications.

How Oklahoma Gas & Electric came to select NONPAREIL Turbine Oil

Laboratory tests result in selection of turbine oil with life-of-turbine guarantee



Oklahoma Gas & Electric Company conducted laboratory tests on a number of turbine oils before finally deciding which oil to use in the turbines at the Company's Mustang and Riverbank stations. NONPAREIL was chosen. OG&E received an oil which is guaranteed for the life of the turbines.

This is why it is possible for NONPAREIL Turbine Oil to carry such a guarantee. Petroleum oil normally contains two types of molecules. One relatively stable type oxidizes to acids. The other less stable type, containing natural inhibitors, forms asphaltenes when combined with oxygen. In making base oil for NONPAREIL Turbine Oil, the asphaltenes or sludge forming type of molecule is removed completely. Oxidation inhibitors, added to the special base oil, stop acid formation. Result is: sludge forming parts having been removed; acid forming is fully controlled.

The inhibiting of acid formation in NONPAREIL is so complete that Standard Oil can guarantee that for the life of the turbine, the neutralization number of the turbine oil will never exceed 0.15 mg. KOH/g.

Get the facts about NONPAREIL Turbine Oil from your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

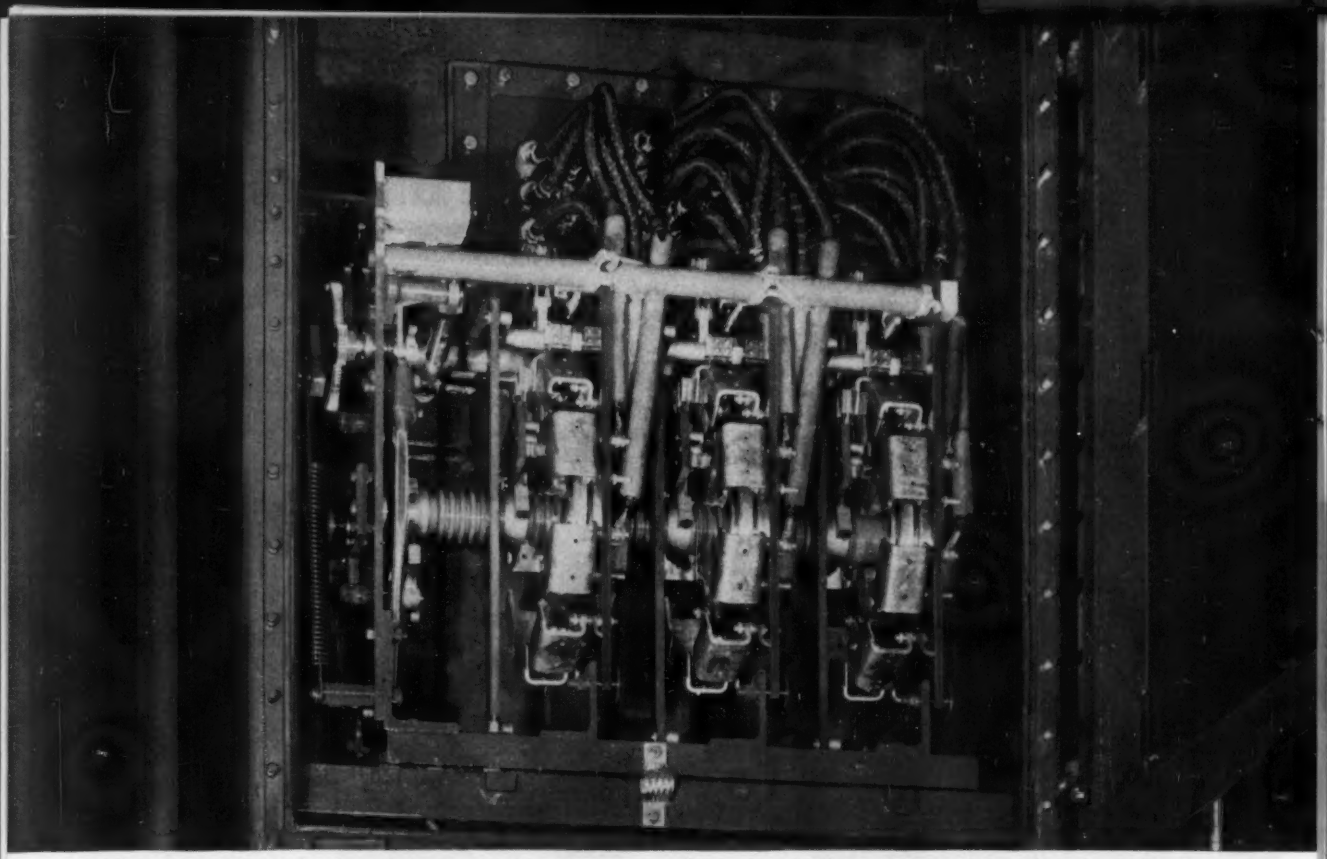
STANDARD

Quick facts about
NONPAREIL Turbine Oil

- Does not form harmful acids.
- Does not form sludge.
- Maintains excellent demulsibility.
- Guaranteed for the life of the turbine.

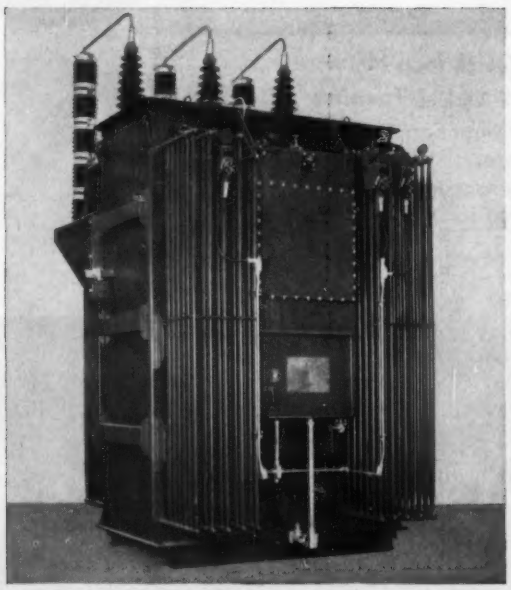
At Riverbank station, John Thornquist talks to George Gibbons and L. E. Cahill, asst. chief and chief engineer respectively. John Thornquist is well qualified to work with utility men on turbine lubrication. He's been doing this work for 19 years with Standard. In addition he has an engineering degree from the University of Minnesota and has graduated from the Standard Oil Sales Engineering School.

(l. to r.) John Thornquist, Standard Oil industrial lubrication specialist with OG&E men J. W. Blake, superintendent of generation, D. O. Lima, chief testing engineer and W. D. Brewer, chief engineer, inspect turbo-generator at Mustang plant.

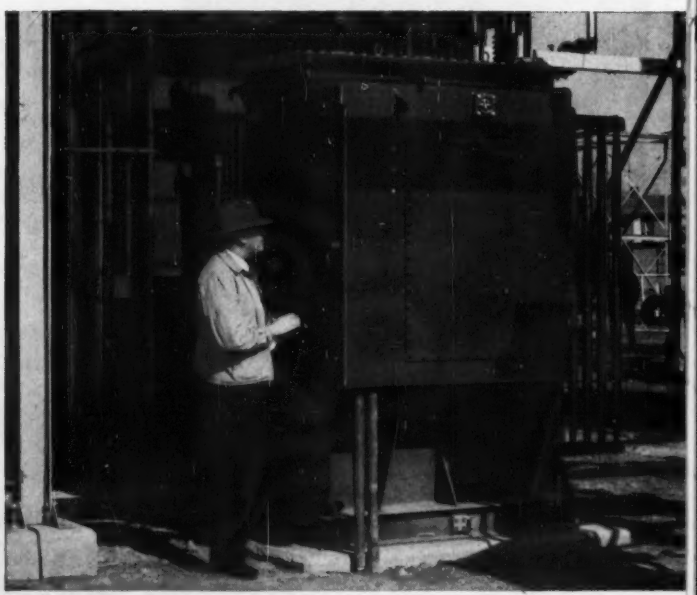


QUIETER OPERATION. Tap-changing switch compartment now houses motor and drive assembly completely immersed in oil to muffle noise and provide permanent lubrication. Formerly, motor plus assembly was in air-filled control compartment. Mounting under oil, and redesigning of geneva gear for smooth driving-pin entry—without impact—has cut peak noise level about 20 db.

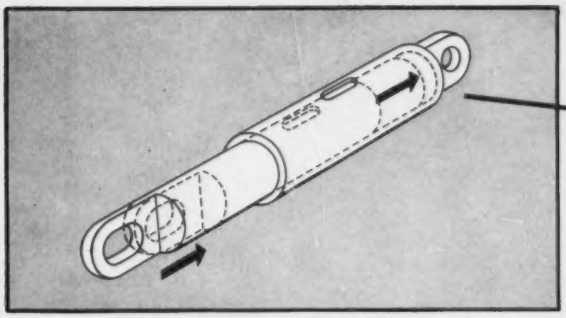
Maintenance reduced 50% by new



RM MEDIUM TRANSFORMERS employ the new LRT-68 load-tap-changing switch in LTC models.

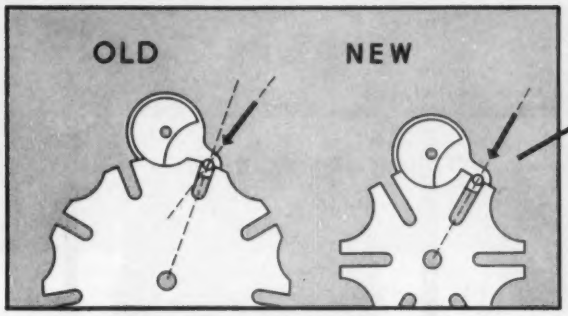


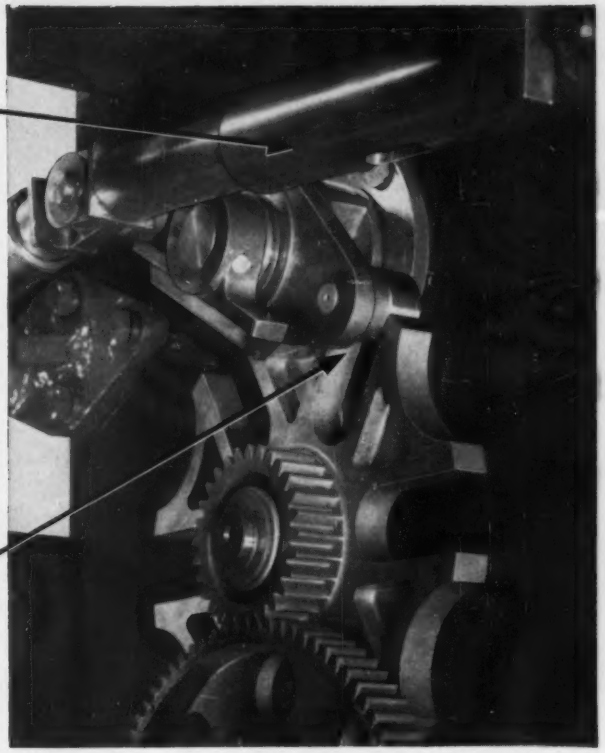
STEP REGULATORS up to 1000 kva will now have the added advantages of the new LRT-68 load-tap-changing switch.



HYDRAULIC DASHPOT

NEW GENEVA GEAR





REDUCED MAINTENANCE. LRT-68 incorporates new hydraulic dashpots and redesigned geneva gear. The two dashpots provide (1) optimum contact separation speed, and (2) reduced engagement velocity, for minimum contact erosion and less secondary arcing.

Geneva gear driving-pin now enters gear slot smoothly, parallel to the side of the slot. Previous design entered at 19° angle. Gentle acceleration and deceleration reduces jarring and mechanical wear. This, plus thicker contact tips, results in 100% increase in tip life.

General Electric load tap changer

Peak operating noise cut 20 db with LRT-68 switch now used on RM transformers and three-phase step regulators

DOUBLED CONTACT LIFE of General Electric's new LRT-68 load-tap-changing switch means routine inspection and maintenance can be *cut in half* on G-E LTC Medium Transformers, and on three-phase step voltage regulators up to 1000 kva.

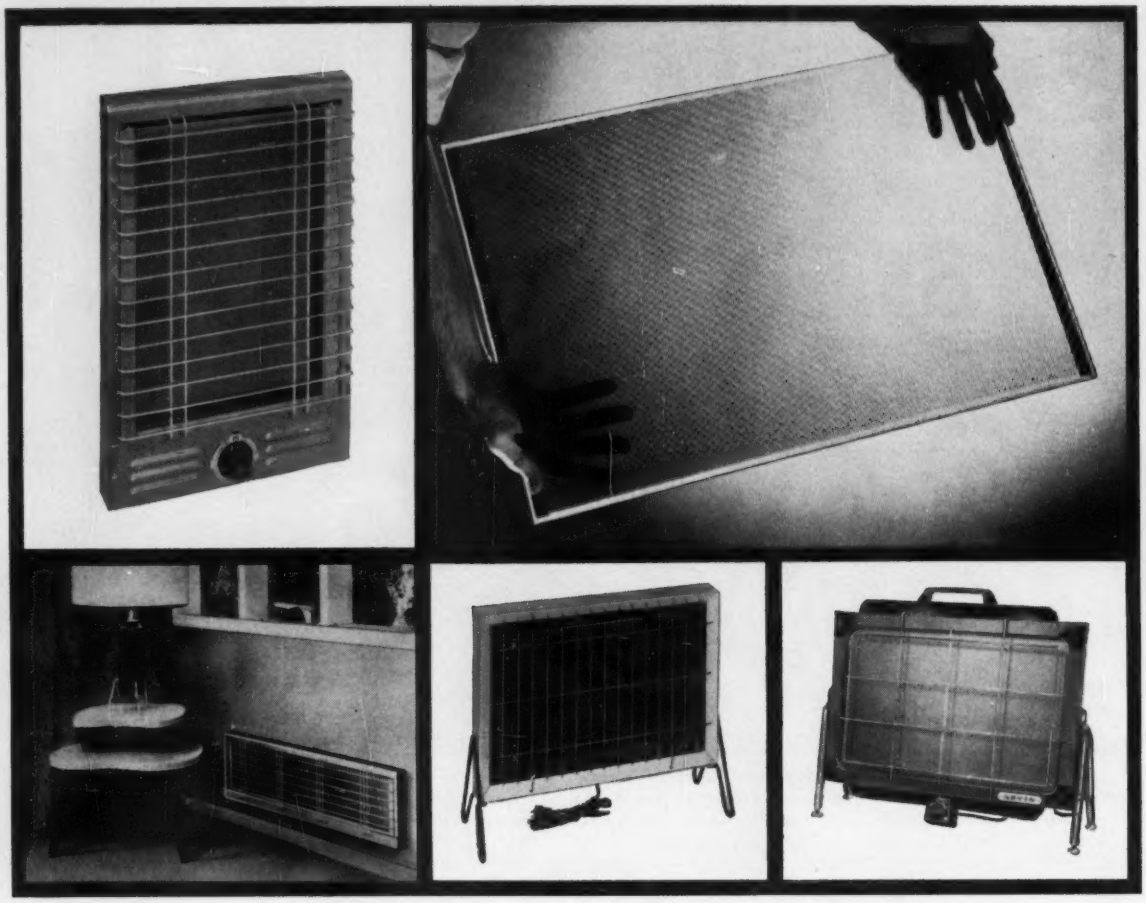
These savings have been made possible by:
(1) reducing the amount of contact wear per operation, through redesigning the geneva gear (providing smoother operation) and adding hydraulic dashpots (for optimum separation and engagement speeds) and (2) using heavier, thicker contact tips, from which more material can wear before replacement is necessary.

REDUCED OPERATING NOISE results from a complete redesign of G.E.'s load-tap-changer. This means increased consumer good will and less investment in sound-absorbing walls and barriers, when LTC equipment is installed in residential areas.

For full information on this new load-tap-changing mechanism and the medium transformers and three-phase, step voltage regulators on which it will be used, contact your nearest General Electric Apparatus Sales Office, or write Section 416-4, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



PYREX® radiant panels make electric heat economically sound . . . *now*

New high-output electric space heaters, equipped with PYREX brand radiant panels, are making electric home-heating economically sound now, even in many areas where rates *seemed* to place it in the future.

Built-ins, and portables for supplementary heating, offer high wattages. This is possible because PYREX panels are of a tempered borosilicate glass that can pack up to 3,000 watts per unit. The need for fewer panels reduces the initial cost of an installation.

Other economies—Because no chimney, ducting or piping is needed, the cost of a PYREX radiant panel installation is equal to, or below that of most conventional heating systems. Utilization of living space—formerly earmarked for heating equipment, is also an economic gain.

The PYREX radiant panel carries a history of proven success in many types of portable space heaters, permanent domestic heating systems and in industrial heating and drying applications.

It enables you to offer your customers the comfort, convenience and cleanliness of electric heat plus these other attractive features:

1. **Safety.** No glowing wires or coils.
2. **Fast, uniform heat.** Infrared rays convert to warmth fast. The entire surface of the PYREX panel radiates heat.
3. **Comfort control.** Every room can have the amount of heat it needs right to the degree.
4. **Silence.** No moving parts.
5. **Space saving.** A unit need be only 2 to 3 inches deep.
6. **Economy.** Savings in construction and installation make electrical heating more practical.
7. **Reliability.** The well-known PYREX trademark identifies dependable values.

Now you can get complete heating systems in many designs. And you can install PYREX radiant panel systems in every heating installation with complete assurance of dependable performance.

Write for more detailed information on the characteristics and advantages PYREX panels offer you.

Corning means research in Glass

CORNING GLASS WORKS

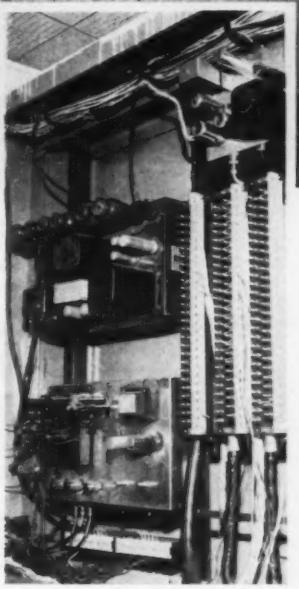
39-12 CRYSTAL STREET • CORNING, NEW YORK

Overall view of automatic electric map and switchboard. Signals recorded on control panels are carried on polyethylene-insulated cable, manufactured by Anaconda Wire & Cable Co., New York 4, N. Y.

San Antonio, Texas...

supervisory control beats heat and humidity

with polyethylene-insulated cable



Terminal box in dispatcher's office, where signals from power plants and substations are brought in on supervisory control cable nearest bottom center.

When a new substation in San Antonio was tied in to its power plant, three miles away, it was equipped with supervisory control cable with insulation that provides a built-in safeguard against the warm, moist Gulf climate. The 16 cable pairs have each of their No. 19 Awg. conductors insulated with BAKELITE Brand Polyethylene. The whole assembly is jacketed with vinyl plastic.

The superior moisture resistance of BAKELITE Polyethylene assures dependable operation in an area where moisture vapor is one of the chief causes of power leakage and failure in cable of ordinary construction. In addition, the polyethylene permits faster splicing. Other factors in selecting this cable: long service life expectancy; minimum maintenance.

BAKELITE Polyethylene satisfies REA requirements for plastic-insulated telephone cable, meets applicable IPCEA specifications for service drop cable, ASA standards for weatherproof wire, ASTM D1238-52 Type II, dielectric materials, and IMSA specifications for fire alarm and signal control cable.

BAKELITE BRAND PLASTICS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC.

design

simplicity

KPF switches are simple and functional in design. This insures a clean, attractive pole top whether phase units are installed in a triangular, vertical or horizontal configuration.

The simple design of KPF switches also assures operating dependability under all weather conditions. KPF switches have no delicate mechanisms to malfunction, freeze, lock, need lubrication or wear out.

KPF switches have proved themselves in almost 50 years of service on major utilities. Make a test installation. Discover their unique dependability on your own system.

Install in the air—or on the ground

- Top (left)—phase units installed in the air, on previously mounted cross arm.
- Middle—phase units installed on cross arm while on the ground.
- Bottom—phase units and cross arm installed on the ground—pole then tilted into place.

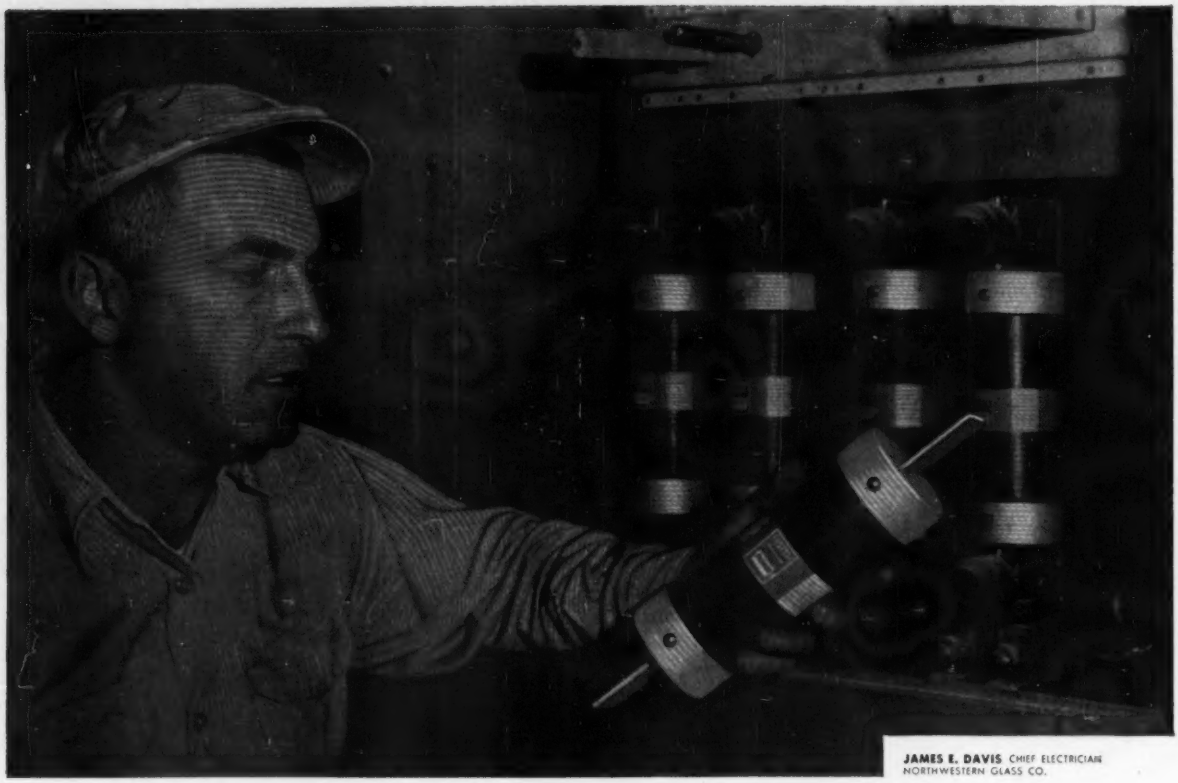
Write direct for catalog

KPF ELECTRIC COMPANY

Dept. E, 1624 E. Alpine Avenue
Stockton 5, California

3893

KPF
AIR BREAK SWITCHES
Standard for nearly half a century



JAMES E. DAVIS CHIEF ELECTRICIAN
NORTHWESTERN GLASS CO.

"Our Production schedule was frequently disrupted by needless shutdowns on a line of motors . . *until we changed to Fusetron Fuses*"

James E. Davis,
CHIEF ELECTRICIAN, NORTHWESTERN GLASS COMPANY
SEATTLE, WASHINGTON

"Ordinary 500 amp. renewable fuses were blowing frequently in a 1000 amp. switch that controls a line of motors ranging in sizes up to 150 hp.

"We work on a tight production schedule, so these shutdowns with men and motors standing idle were costing us a considerable amount of money and trouble.

"As chief electrician, the problem was 'thrown in my lap'.

"A study of the situation indicated that harmless surges were causing the fuses to blow.

"We figured that the long time-lag of Fusetron dual-element fuses might correct the trouble.

"They were installed in 1953 and the original Fusetron fuses are still in service.

"We think this is quite a record because the switch is loaded to capacity 24 hours a day 7 days a week, only Christmas and July 4th excepted."

Here's why Fusetron Fuses give all purpose Protection

A fuse link combined with a thermal cutout - the result, a fuse with tremendous time-lag and much less electrical resistance and an interrupting rating in excess of 100,000 amps.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses. FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 amperes, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Write for bulletin FIS.

THOMAS F. CURRAN
MACHINE OPERATOR

FOR LOADS ABOVE 600 AND UP TO 5,000 AMPS., USE BUSS HI-CAP FUSES . . .

They have unlimited interrupting capacity to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

Write for bulletin HCS.

FUSETRON DUAL-ELEMENT FUSES DO MORE THAN ELIMINATE DOWN PERIODS CAUSED BY NEEDLESS BLOWS . . .

They Provide 10 Point Protection . . . .

1. High interrupting capacity — protect against heaviest short-circuits. Have proven on tests to open safely on circuits set to deliver in excess of 100,000 amperes.
2. Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.
3. Protect against needless blows caused by harmless overloads.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect against waste of space and money permit use of proper size switches and panels.
6. Protect motors against burnout from overloads.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Protect motors against burnout due to single phasing.
9. Make protection of small motors simple and inexpensive.
10. Protect coils, transformers and solenoids against burnout.

Play Safe!* install FUSETRON *dual-element Fuses and* BUSS *Hi-Cap Fuses throughout entire Electrical System!

BUSSMANN MFG. COMPANY
(Division of McGraw Electric Co.)
UNIVERSITY AT JEFFERSON ST. LOUIS 7, MO.

1256

The advertisement at the right is part of the Kennecott-sponsored national advertising campaign for better home wiring. Its purpose, and that of other advertisements in the series, is to make homeowners recognize the importance of full-powered copper wiring to the convenience, comfort and safety of their homes.

Here is an effective "public service" campaign that benefits *you*. By helping break the bottleneck of inadequate home wiring, *it helps you to increase your sales of power!*

Let this campaign work for you directly, in your own territory, teamed with your own local, adequate wiring promotions. Send today for *free* reprints and poster-sized blowups of Kennecott's latest national advertisements featuring "Skimpy Wiring." Get *free* copies of the educational booklet, "The ABC of Home Wiring." Ask for complimentary Home Wiring Wall Chart, mat service folder and list of at-cost prices for all material available. No cost or obligation! Just write on your letterhead to Kennecott Copper Corporation, Dept. W126, 161 East 42nd St., New York 17, N. Y.

The best wiring is **copper**

This ad appears in:
This Week Magazine Section, Sept. 23, and Chicago Tribune Magazine Section Oct. 21

He slows down the best of appliances!

Don't blame your toaster for making toast too slowly. "Skimpy Wiring" may be holding it back. His weak, undersized wires and inadequate circuits keep toasters, and other electrical appliances, from getting the full power they need to operate at their best.

Find out how to rid your home of the electrical ills symbolized by "Skimpy Wiring". Learn how easy it can be . . . how little it can cost . . . to give your home the full HOUSEPOWER of an *up-to-date copper wiring system.* Talk it over with your local power company or electrical contractor.

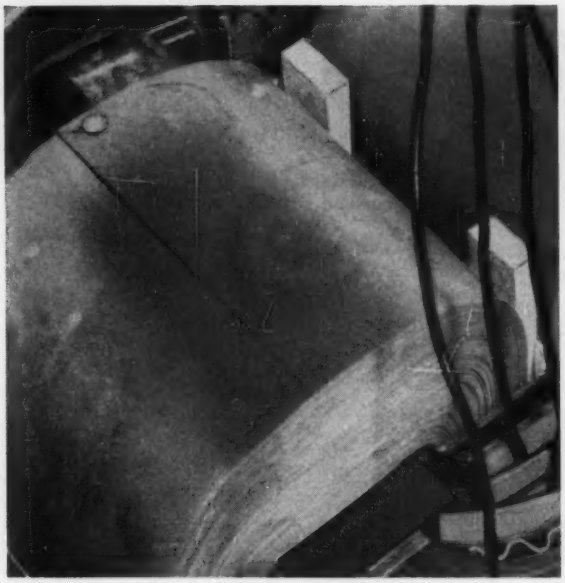
Get FREE Booklet! "The ABC of Home Wiring" explains facts about your electricity, how you can make it serve you better. Write Kennecott Copper Corporation, Dept. T106, Box 238, New York 46, N. Y.

Kennecott Copper Corporation

Fabricating Subsidiaries: Chase Brass & Copper Co. • Kennecott Wire and Cable Co.

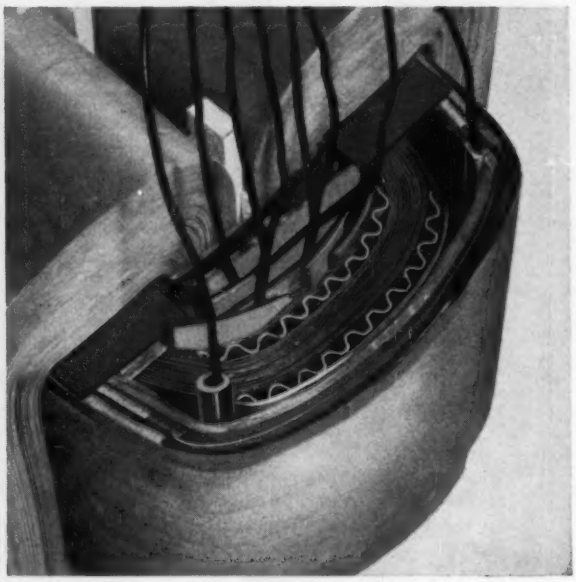
4 KUHLMAN TRANSFORMER FEATURES YOUR DISTRIBUTION SYSTEM'S

Kuhlman increases distribution system efficency by continuously improving basic transformer design. While new features have been added as they have been proved . . . major benefits spring from Kuhlman's concentration on engineering refinements in the basic components of transformer design . . . the core, coil, construction and insulation. Your study of the features illustrated below will show what we mean. Why not check your local Kuhlman representative on *all the features* that make Kuhlman your No. 1 transformer buy.



***FEATURE*—BENT IRON CORE:**
Lapped construction eliminates air gaps, offers low flux density in the lapped areas.

RESULT:
Lower exciting current; less load on the distribution system; reduced operational costs.



***FEATURE*—BALANCED COIL:**
Compact windings of low temperature rise are balanced with ample cooling ducts for oil circulating and rapid heat transfer.

RESULT:
Greater short-time overloading capacity; longer, more reliable transformer life.

HOUSEPOWER HELPS YOU LIVE BETTER ELECTRICALLY

LIVE BETTER ELECTRICALLY

KUHLMAN

BAY CITY, MICHIGAN • CRYSTAL SPRINGS,

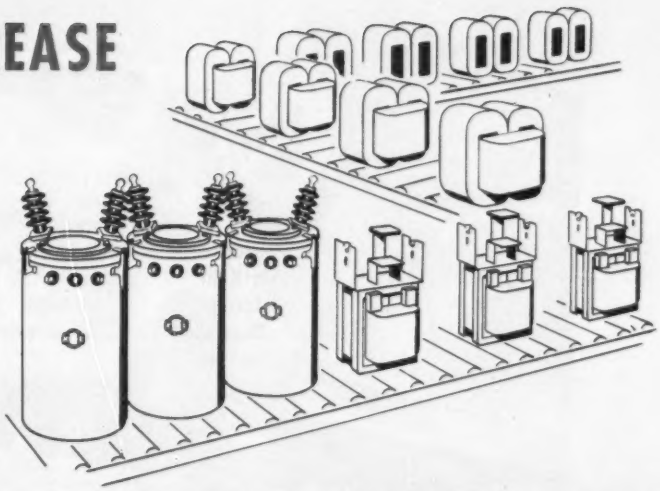
THAT CAN INCREASE EFFICIENCY...

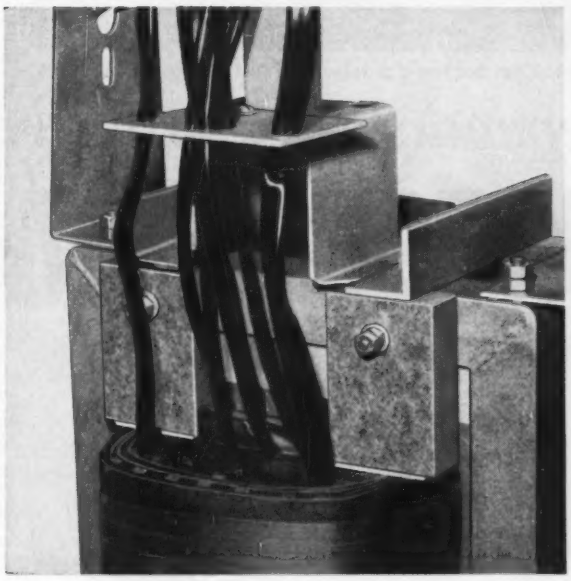
★ LOW EXCITING CURRENT

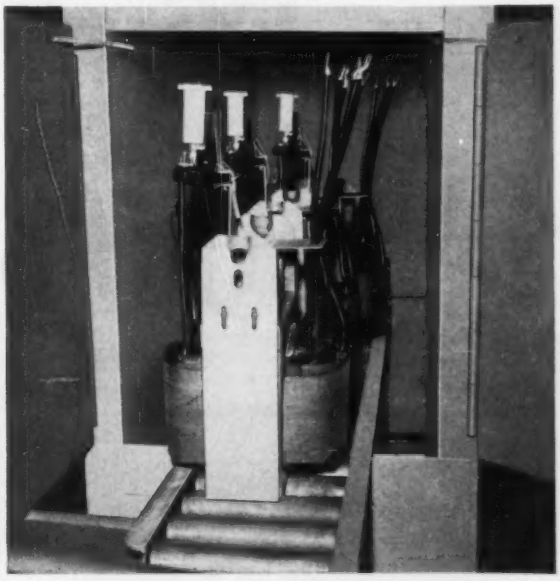
★ CAPACITY TO SPARE

★ RIGID CONSTRUCTION

★ LOW POWER FACTOR







***FEATURE*—RIGID CONSTRUCTION:**
Core and coil assembly held firmly in place by core clamp; additional blocking for coil support; leads held rigid by lead guides.

RESULT:
Greater protection against short-circuit stresses and damage from handling and shipping. Longer trouble-free operating life.

***FEATURE*—POWER FACTOR CONTROL:**
Moisture eliminated by controlled processing; coils pre-dried before varnishing . . . coils varnished and baked . . . core and coil assembly dried on the line (as shown above) . . . unit is tanked and put under oil while still above room temperature . . . vacuum removal of all entrapped air.

RESULT:
Low power factor indicating high insulation strength and assuring long service life.

ELECTRIC COMPANY

MISSISSIPPI • SALINAS, CALIFORNIA

572

The Alcan test run was supervised and certified by the AAA.

Never-say-die dependability proved

NEW TASK•FORCE 57

Six new '57 Chevy trucks tamed the rugged
Alcan Highway in one round-the-clock sprint.
They covered the grueling run in less
than 45 hours (normally a 72-hour run)!

Up towering grades, through washouts, blinding dust and pounding gravel—these heavily loaded Task-Force huskies took everything the Alcan could dish out, and still they trimmed almost 30 hours off the normal running time! As a special test, two of the engines were not stopped once during the entire trip. Gas mileage ranged up to 18.17 miles per gallon! A Powermatic-equipped heavyweight went all the way in a single forward-speed range! "Despite the severity of the test under the most adverse road conditions," states the official AAA report, "not a single truck turned back or dropped out due to mechanical failure." Put an Alcan-proved Chevrolet truck to work on your job! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

on the Alcan Highway!

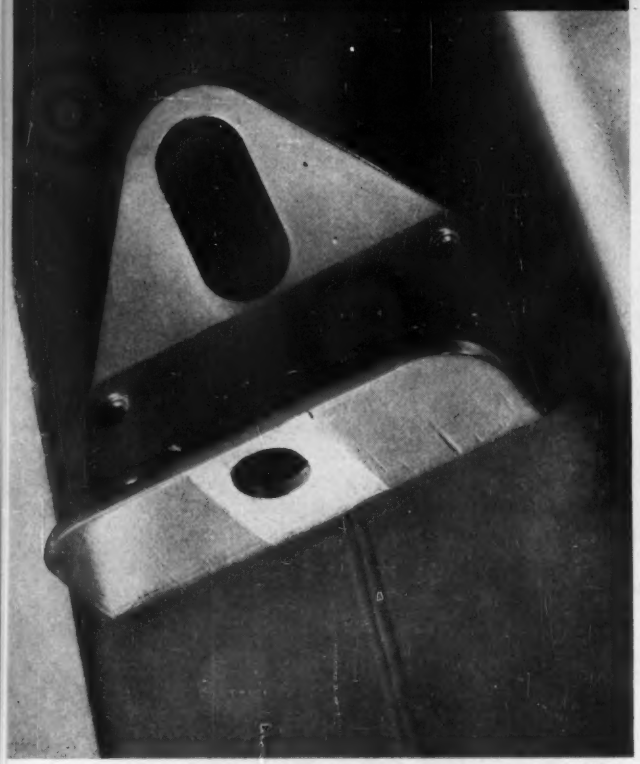
CHEVROLET TRUCKS

NO JOB TOO TOUGH FOR THE ALCAN CHAMPS!
Whether your job calls for fast-working efficiency against tight schedules or big muscles for off-the-road grinds—there's an Alcan-proved Chevrolet Task-Force truck ready to save you time and money!

DROP BY YOUR CHEVROLET DEALER'S SOON.
Look over his new Task-Force line for '57. You'll spot the modern features that put new Chevy trucks way out in front. You'll see right off why they're first choice with most truck buyers!

PROVED ON THE ALCAN HIGHWAY . . . CHAMPS OF EVERY WEIGHT CLASS! CHEVROLET

1 POSITIVE GROUND

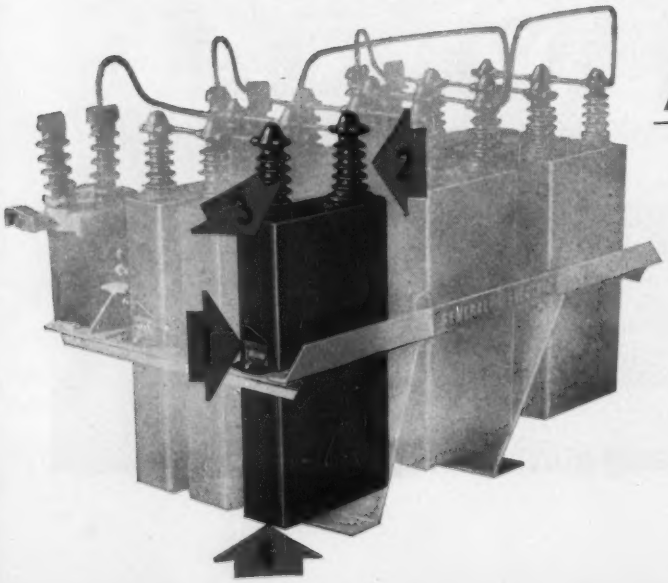


Permanent grounding is assured through an unpainted area on the bottom of the mounting bracket. Each capacitor bracket is welded to the case at eight points to provide maximum strength for hoisting and mounting.

2 PERMANENT CONNECTION

This new bushing and terminal assembly combines excellent electrical and mechanical characteristics. It accommodates aluminum or copper conductors in a 1000-lb. grip that compensates for cold flow.

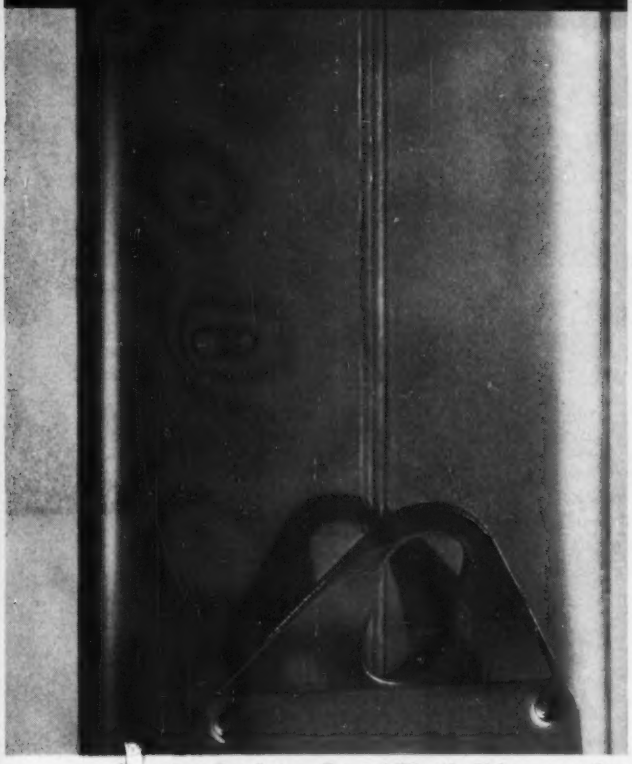
Four capacitor features



Engineered Extras

● of General Electric's 50-kvar capacitor make this unit and the equipments in which it is used the most efficient and economical source of kilovars available today—further evidence of General Electric's efforts to give you the most for your capacitor investment.

3 PRECISION WELD



The case of each new General Electric 50-kvar capacitor is automatically welded to provide a seam of controlled quality and uniform strength. In fact, this precision welded, hermetic seal is as strong as the case itself.

4 RECESSED BOTTOM

Recessed bottoms reduce scraping of the protective coating during warehousing and installation. This construction also prevents rain drops from collecting on the bottom of the capacitor and corroding the case.

that make a difference

The new General Electric 50-kvar capacitor—first of its rating in the industry—gives you these important Engineered Extras along with:

Less Weight Per kvar. One 50-kvar capacitor weighs 15% less than two 25-kvar capacitors. In switched equipments this provides an even greater weight saving—up to 25%.

Lower Cost Per kvar. One 50-kvar capacitor costs 10% less than two 25-kvar units. In switched equipments costs can be reduced even more—up to 25%—since a 600-kvar equipment needs no more switches than a 300-kvar equipment.

Because of General Electric's intensive capacitor research, capacitors have been continuously reduced in price. Today, the 50-kvar capacitor costs only $3.82 per kvar, or 55% less per kvar than capacitors of 20 years ago. For complete information about them, contact your G-E Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y.

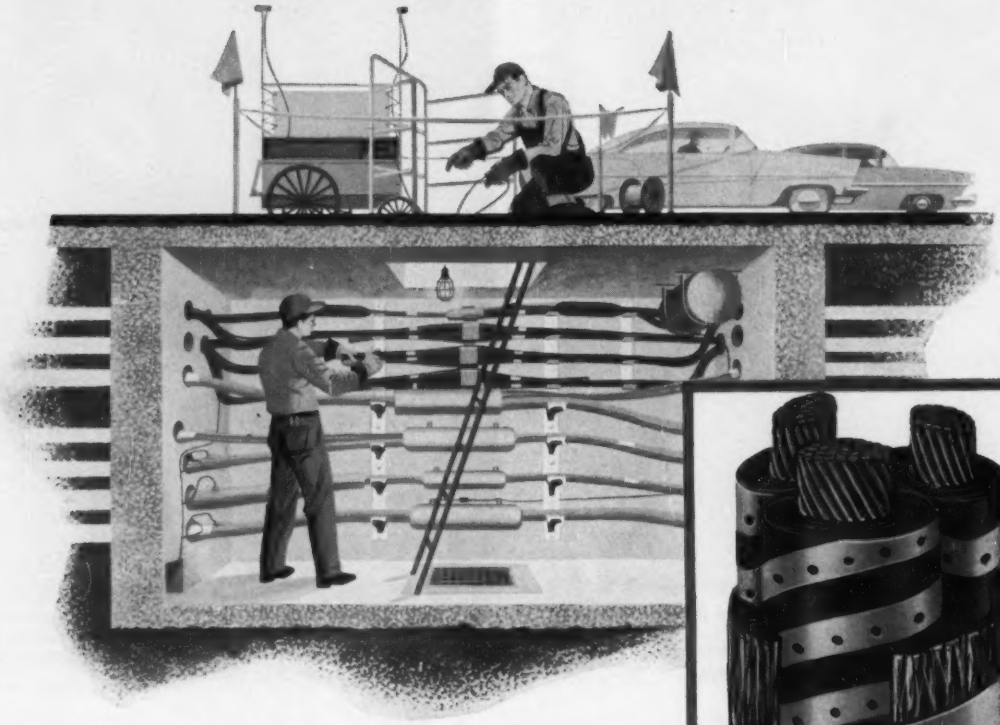
441-36

Progress Is Our Most Important Product

GENERAL ELECTRIC

OK! You want a longer-lived cable!

YOU'LL GET IT, WITH ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH



1—SUPERLATIVE FATIGUE RESISTANCE. With today's high operating loads and temperatures, cables periodically move and bend more than previously. Fatigue cracks develop and cause premature failure of ordinary sheaths.

Tests conducted in temperature-controlled ovens on full cable sections at 150°F, one cycle per minute and at a bending radius of 7 times the cable diameter, show that Roebling tellurium lead alloy has 4½ times the fatigue resistance of copper-bearing lead in the range of service strains!

2—LOWEST LONG-TIME CREEP RATE. Many cables today employ low viscosity impregnating compounds that tend to migrate and accumulate on steep profiles. Still other cables are gas filled at low or medium pressures. For all these types a creep-resistant sheathing material is essential for long service life.

Tests conducted at 200 psi, 150°F, for a period of 4,000 hours, show that Roebling tellurium lead alloy has only one-tenth the creep rate of copper-bearing lead!

Write for full information about Roebling Paper Power Cable with Tellurium Lead Alloy Sheath . . . the most important sheath development in years.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

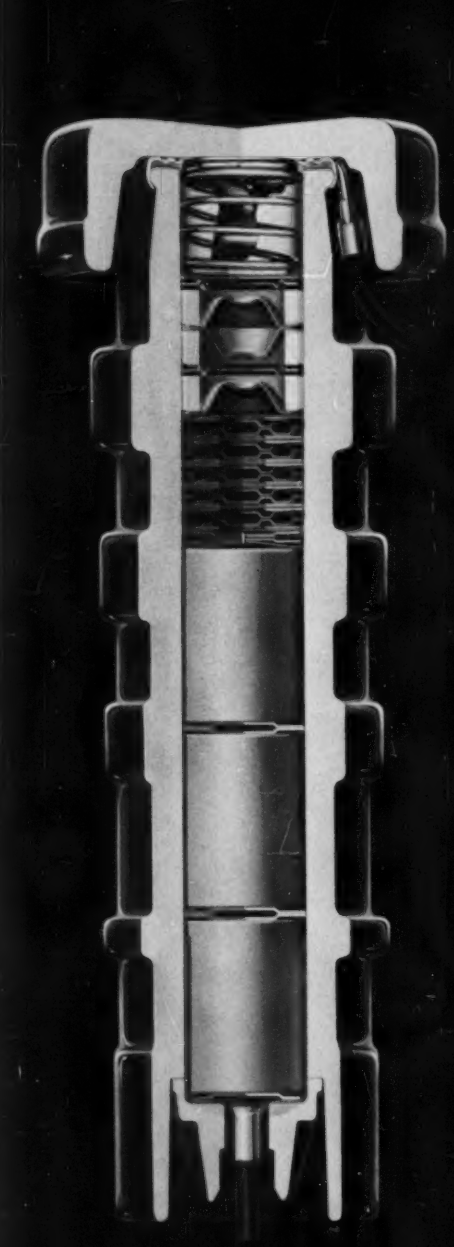
JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13325 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

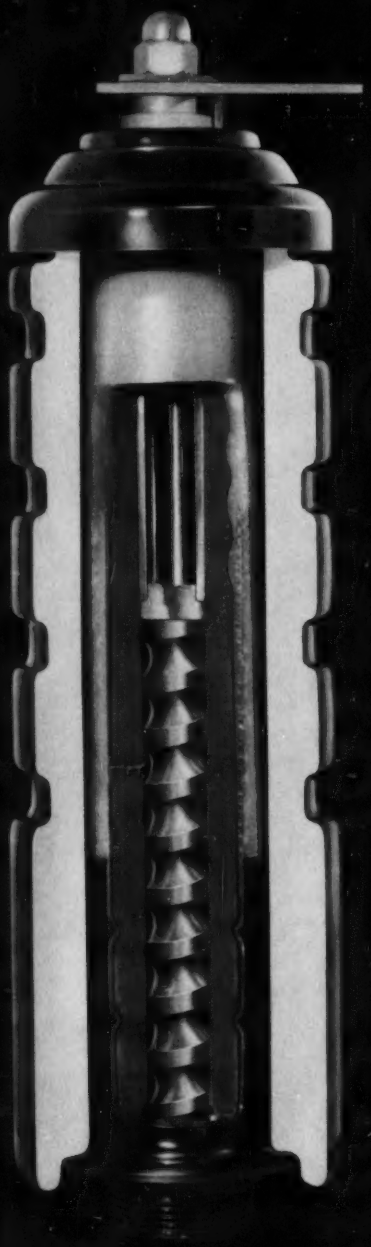
Valve or expulsion arresters?

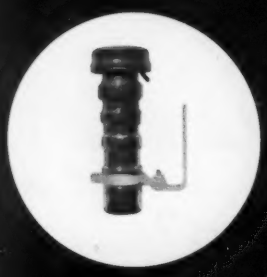
The two basic types cover all applications

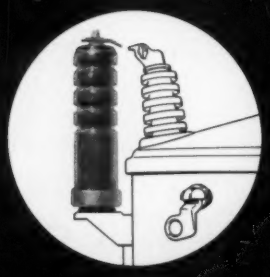
WATCH WESTINGHOUSE!

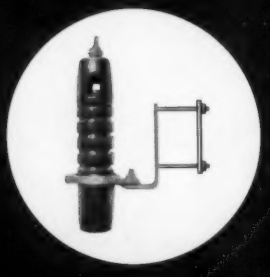
*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

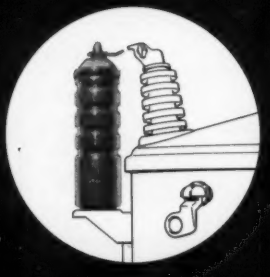












LV LVT LX LXT

VALVE EXPULSION

Valve or Expulsion...

Only Westinghouse is in the unique position of having a complete line of both types—each having outstanding performance.

There is *no real controversy* over valve versus expulsion arresters . . . *if* the basic design of both is sound.

Westinghouse was the originator of both types: Valve type invented by Dr. Slepian in 1922; expulsion, by Torok in 1933. Improvements by Westinghouse in both designs have been continuous, keeping pace with the "stiffening" requirements of distribution systems, until today both Westinghouse arresters are evaluated as providing equal lightning protection.

The following explains why . . .

LIFE . . .

Confused claims of superior life expectancy for either type are misleading. The life expectancy of a Westinghouse design, valve or expulsion, averages well beyond that of any transformer it may be installed on to protect. Field records on CSP® transformers indicate 26 million arrester years of service with less than .026% failure rate.

APPLICATION . . .

How close to a substation they may be installed is never a problem with either Westinghouse arrester. Autovalve® blocks have such inherent resistance at line-to-ground voltage that "follow current" is low in value. Westinghouse expulsion arresters likewise limit follow current to only a few hundred amperes. The unique spiral groove and molded jacket design provide the most effective current-limiting expulsion arrester available today.

DIRECT STROKES . . .

Both Westinghouse valve and expulsion arresters not only meet the industry standards of 65,000 surge-amperes, but have been tested well in excess of this level. For example, 9-kv arresters, both types, have successfully discharged currents in excess of 100,000 amperes.

PROTECTIVE CHARACTERISTICS . . .

Impulse spark over is safely below the insulation level of the transformer protected. Yet the 60-cycle spark-over levels of both Westinghouse designs are high enough that harmless switching surges will not cause arrester operation. No other designs achieve this unique and exclusive balance . . . an engineering decision reached by Westinghouse, based on more years of arrester experience in the field than any other manufacturer.

FUSE COORDINATION . . .

Both Westinghouse valve and expulsion arresters limit follow current to less than a half cycle. Since coordination between transformer and sectionalizing fuses requires more than a half cycle, Westinghouse arresters do not enter into this problem.

SERVICE RECORD . . .

Westinghouse, with more arresters in service today than any other manufacturer . . . of both types . . . computes a better than 99.974% perfect service record.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Westinghouse recommends

expulsion (LX-T) arresters for CSP transformers

because . . .

APPLICATION

The arrester application problems such as: spark-over voltage, surge-current ability, discharge voltage, 60-cycle short-circuit capacity and arrester life become the primary responsibility of the manufacturer when a coordinated CSP packaged unit is purchased. The Westinghouse expulsion arrester has all the desirable characteristics which are needed to protect the transformer and the system.

FIELD RECORD

Since the introduction of the CSP transformer, over 1.5 million Westinghouse CSP's with expulsion arresters have been installed. The field record of these units indicates over 26 million arrester years of service with a failure rate of less than .026%.

STANDARDIZATION

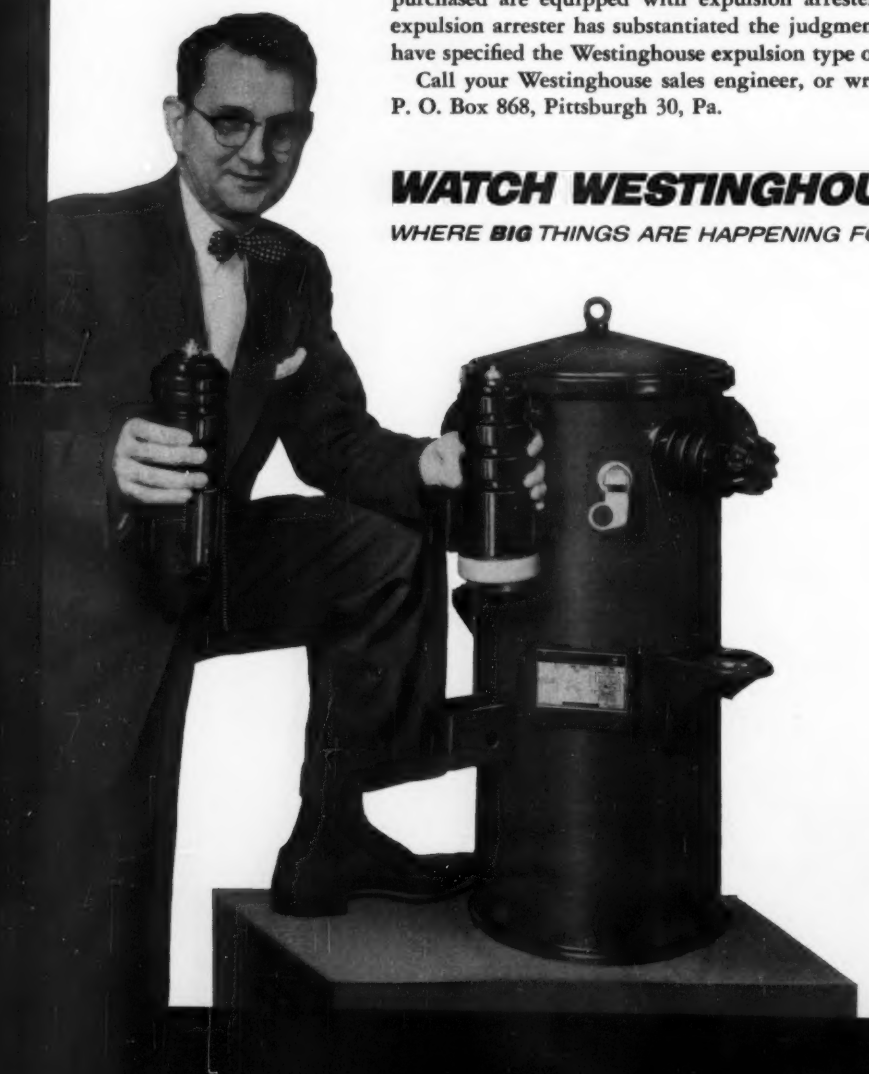
It makes sense to standardize on an arrester with proved superior performance — to help utilities reduce ordering problems and improve service through this standardization.

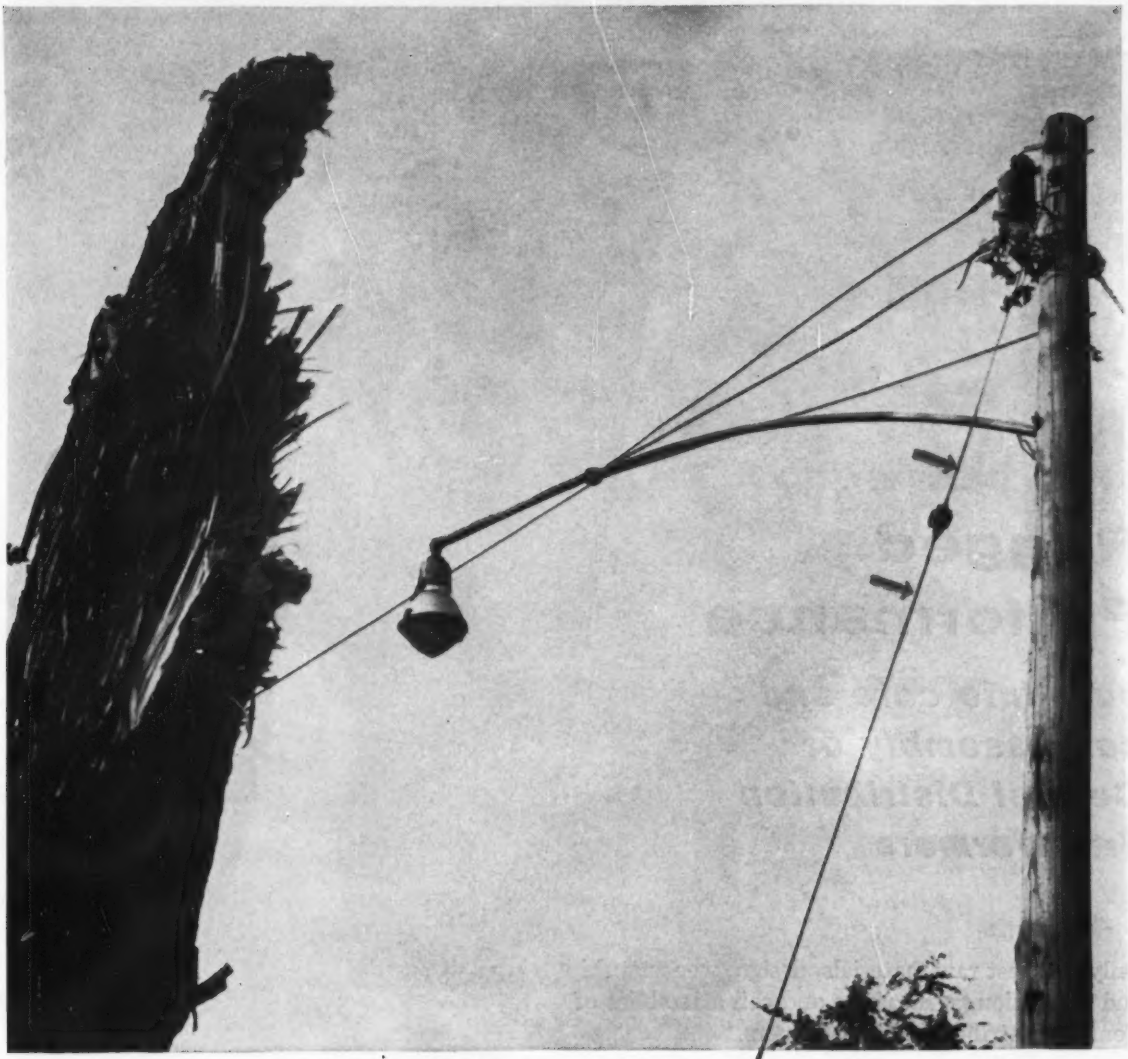
Today after 23 years of experience, 97% of Westinghouse CSP transformers purchased are equipped with expulsion arresters. The compiled record of the expulsion arrester has substantiated the judgment of those utility engineers who have specified the Westinghouse expulsion type on CSP's.

Call your Westinghouse sales engineer, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-70771

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***





75 - 100 MPH Wind Rips off Tree

PLP *GUY-GRIP* Dead-Ends Stand Firm

Nature provided the test. Hurricane-strength winds—75-100 miles an hour—snapped off the top half of a huge elm tree ... and hurled it against both pole and guy. After the debris was removed... the picture told it's own dramatic story. Here's graphic evidence that today's best answer to any guying problem... subjected to any kind of condition... is PLP Guy-Grip dead-ends.

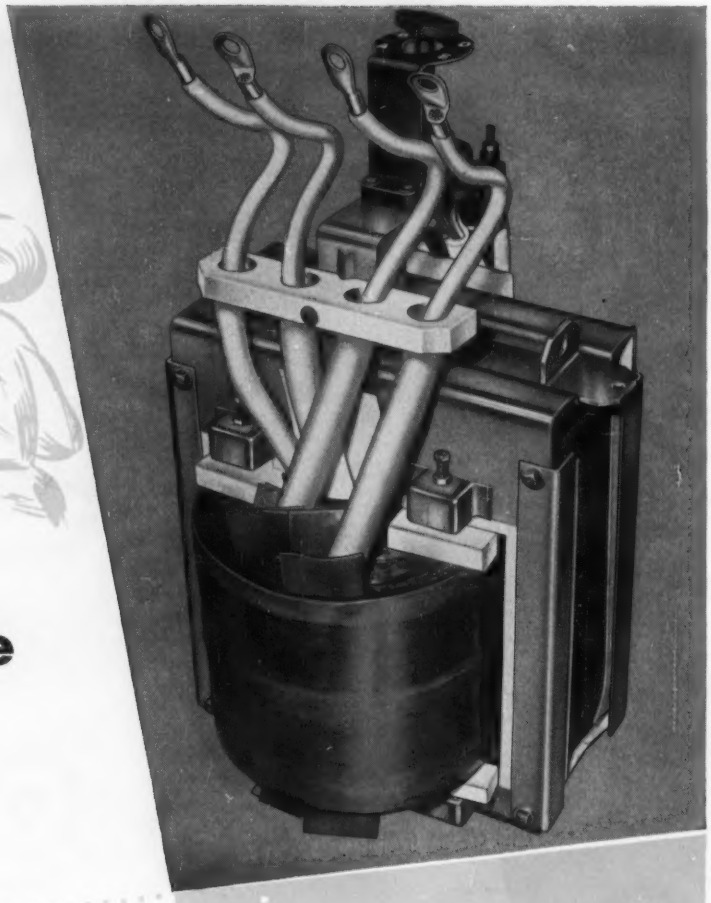
Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents pending.

PX – 77

PREFORMED LINE PRODUCTS COMPANY

33498 St. Clair Avenue Cleveland 3, Ohio

TELEPHONE: CLEVELAND EXPRESS 1-2571



Rugged Performance

built into core and coil assembly of Central Distribution Transformers

Only the best raw materials, design, workmanship and inspection go into core and coil assemblies of Central Distribution Transformers.

Grain oriented, cold rolled steel is used in the wound core design. Maple blocks are attached to the sturdy frame on all core and coil assemblies, 15 KVA and above, to prevent shifting of the coil under overload or short circuit conditions.

The tap changer has a glazed porcelain body and high conductivity copper alloy contacts. The molded bakelite handle extends above the hot oil level to assure easy and positive operation of the high pressure spring loaded contactor. A fiber board provides clear indication above oil of the position of the tap changer.

This rugged construction of the core and coil assembly is an important reason why Central Distribution Transformers have gained wide acceptance in the Electrical Industry.

A type for every need—from the smallest to the largest.

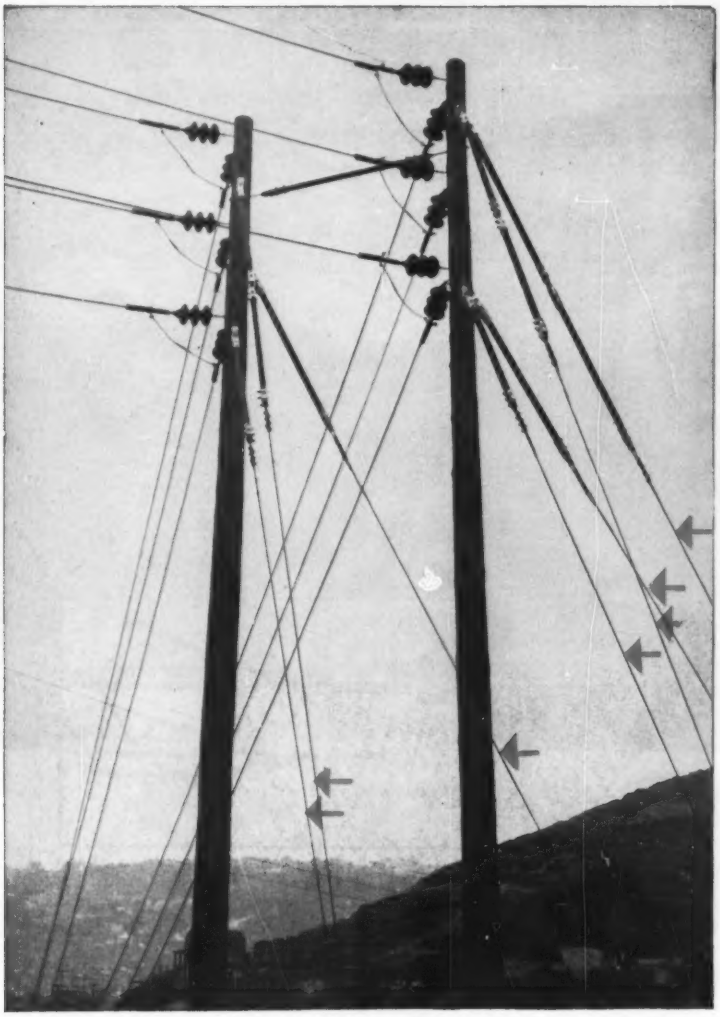
Designers and Manufacturers of Transformers only

CENTRAL

TRANSFORMER CORP.

PINE BLUFF, ARKANSAS

Sales Offices in principal cities



These "new" Copperweld Guys are 30 years old —and still going strong!

Installed 30 years ago, these Copperweld* Guys are as "new," safe, and strong today as the day they were put up—still good for many more years of dependable, maintenance-free service.

Unusual? Not for Copperweld. When it's up, it's up to stay—an advantage of vital importance to every operator of overhead lines.

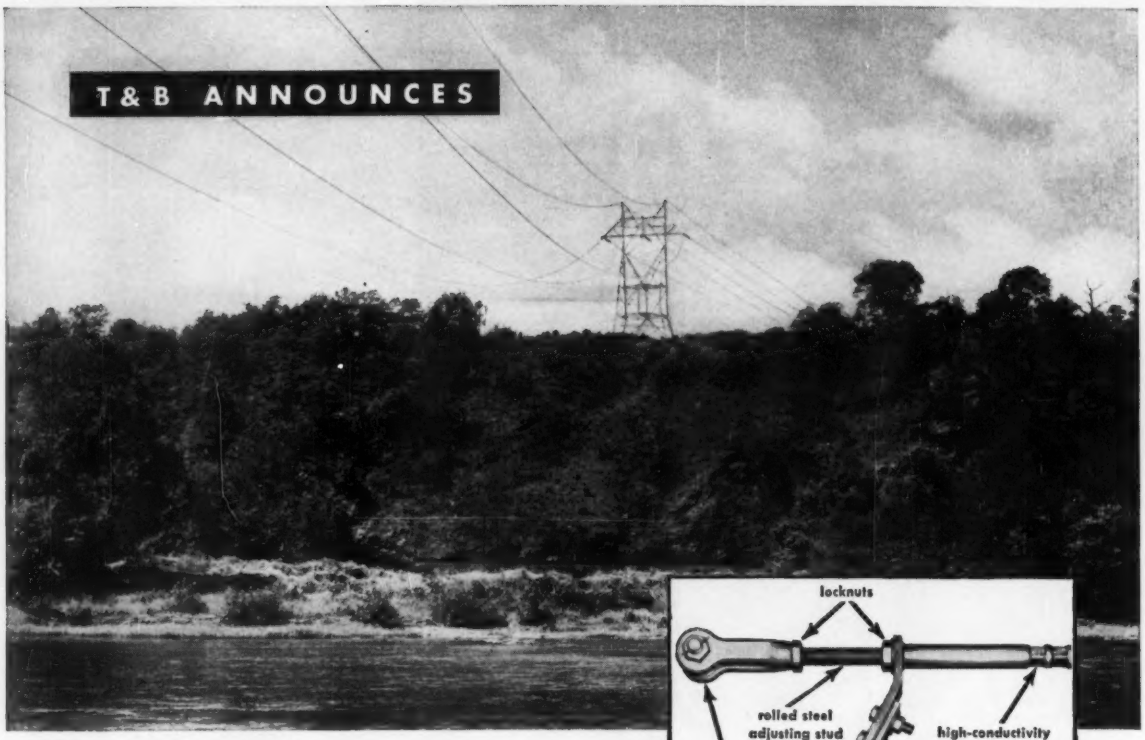
Non-rusting Copperweld Strand, with its permanent high strength, matches pole life—eliminates guy repair and replacement costs. And, when you consider that the price of the guy strand is such a small part of the total installation cost, it's false economy to use anything but Copperweld—the best guy strand available.

*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

GUY STRAND

***The Best* in Terms of Safety and Service!**



a new concept in transmission dead ending!

DEAD END CONNECTORS PERMIT SAG CORRECTION AFTER JOINT IS COMPLETED

Now you can adjust conductor sag to specification after the strain connection has been made! Four inches of clevis adjustment available provides great sag adjustment. For example: in a 700 foot span of 795,000 CM A.C.S.R. sagged at 50% of ultimate strength, the 4 inch clevis adjustment will allow 4 feet of sag adjustment.

The new dead end connector gives many important advantages: transmission line dead ending at river crossing and over rough terrain is simplified, more economical; "bundled" cables can be easily sagged with complete uniformity; line measurement errors can be readily compensated.

T&B Dead Ends are available for all commercial sizes of A.C.S.R. and all-aluminum conductors in three types: single bolting pad, double bolting pad, and with an integral compression loop connection.

For complete specifications on the new dead ends, as well as the complete new catalog of T&B Method transmission line connectors, tools and accessories, send the coupon below.

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

LOOK FOR THIS SIGN — IT'S THE MARK OF AN AUTHORIZED DISTRIBUTOR

THE THOMAS & BETTS CO. INCORPORATED

14 BUTLER STREET, ELIZABETH 1, NEW JERSEY

Please send me the new T&B Method Bulletin 70

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

extraordinary!

The New Forward Control 'Jeep' FC-150, G.V.W. 5,000 lbs., powered by the rugged, economical engine that made 'Jeep' vehicles famous.

Now...the completely new

Forward Control 'Jeep' FC-150

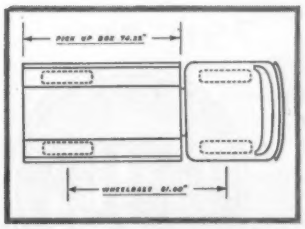
- ***New Forward Control design***
- ***Maximum cargo space on minimum wheelbase***
- ***"Go-anywhere" maneuverability***
- ***Famous 'Jeep' ruggedness and economy***
- ***4-wheel-drive traction and versatility***

Meet the world's newest, most exciting 4-wheel-drive Truck. New Forward Control design is the secret!

It's the first time a 4-wheel drive truck has so effectively combined outstanding maneuverability with so much cargo capacity! This newest truck concept puts a 74" pickup box on an 81" wheelbase to give you record-breaking cargo space per inch of wheelbase.

The new 'Jeep' FC-150 gives you safety-tested big-truck features with traditional 'Jeep' stamina and versatility. This newest addition to the famous 'Jeep' family, retains all the rugged, versatile, functional features you'd expect to find in any 'Jeep' vehicle.

Ask your 'Jeep' dealer for an on-the-job demonstration!



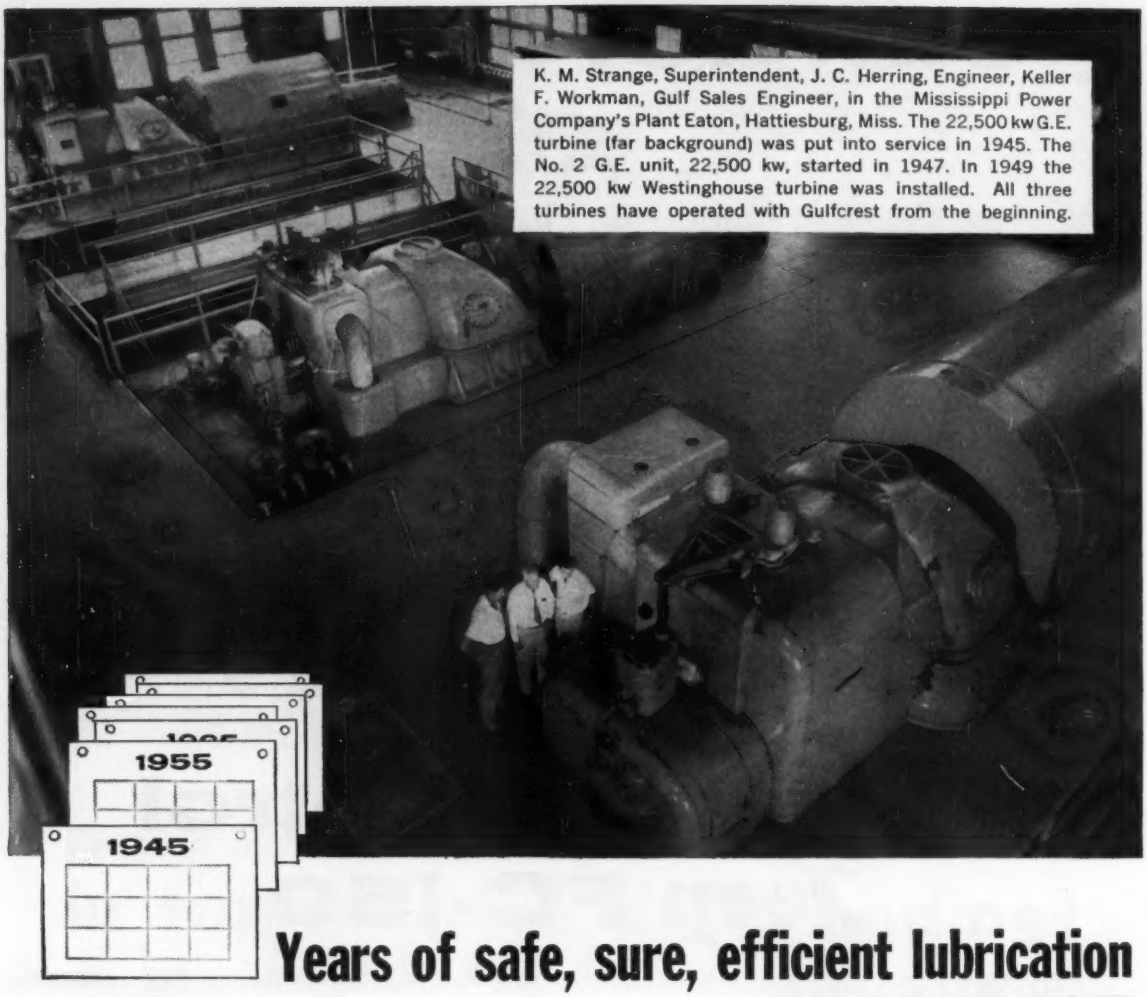
New Forward Control Design places the engine behind you, puts every inch to work, gives you up to 200% greater visibility.

New Safety-View Cab is extra roomy, has largest wrap-around windshield in the FC-150 weight class.

'Jeep' Forward Control
4-Wheel-Drive FC-150

Willys...world's largest makers of 4-Wheel-Drive vehicles

WILLYS MOTORS, INC.



K. M. Strange, Superintendent, J. C. Herring, Engineer, Keller F. Workman, Gulf Sales Engineer, in the Mississippi Power Company's Plant Eaton, Hattiesburg, Miss. The 22,500 kw G.E. turbine (far background) was put into service in 1945. The No. 2 G.E. unit, 22,500 kw, started in 1947. In 1949 the 22,500 kw Westinghouse turbine was installed. All three turbines have operated with Gulfcrest from the beginning.

Years of safe, sure, efficient lubrication ahead for these turbines with GULFCREST

Gulfcrest's unmatched record of performance in every type of steam turbo-generator guarantees safe, sure, efficient protection for these three units down through the years.

These units have operated with clean lubricating systems since going into service—no rust, sludge or foam. At last check, neutralization numbers were as low as ever.

Gulfcrest, super-refined by Gulf's exclusive Alchlor Process, lasts indefinitely. It has served in several large turbines for *over 20 years,* with no significant change in original characteristics! The Alchlor Process takes place *after* thorough refining of carefully selected crude oils—and removes unstable hydrocarbons that normal refining doesn't remove.

Gulfcrest is the world's finest turbine oil, incomparably stable. Your Gulf Sales Engineer will recommend the proper grade for you—just call the nearest Gulf office.

GULF OIL CORPORATION
GULF REFINING COMPANY
1822 Gulf Building
Pittsburgh 30, Pennsylvania

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

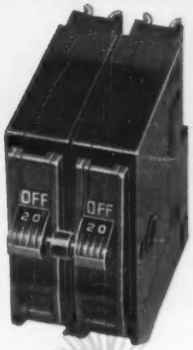
Something NEW Has Been Added To—

QO—FINEST BREAKER EVER BUILT!

1-POLE

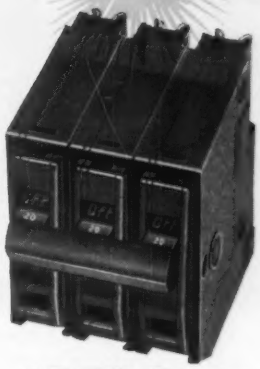
15-50 Amps

2-POLE



15-70 Amps

3-POLE



15-50 Amps

ONE, TWO and THREE POLES GO ANYWHERE—UNLIMITED!

Square D's NEW 3-pole QO crashes the 3-phase price barrier!

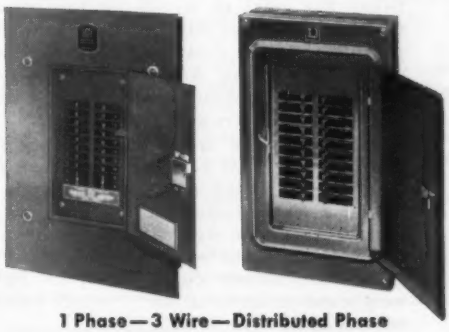
Square D's 2-pole QO Now extended to 70 Amperes for heavier loads!

QO FEATURES

- One size per pole. No space penalty
- Plug-in mounting. No time-wasting screws
- Silver-plated connections equal to best bolted design
- Switches like a "T" rated switch
- Temperature-corrected. No nuisance tripping
- Meets Federal Spec WP-131A—Class A
- Box lugs on line, load and neutral
- Rejection "ears" prevent overprotecting mistakes
- **NO CALL BACKS**

Write for QO Bulletin. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

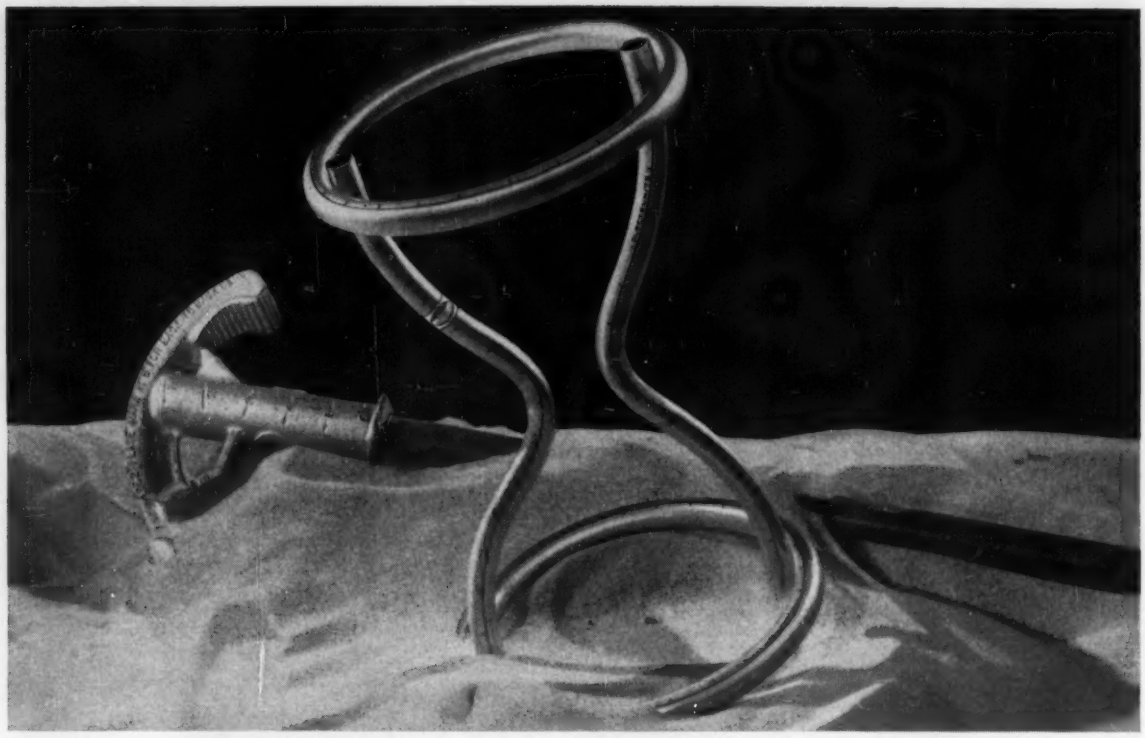
SAME BREAKER...PANELBOARDS & LOADCENTERS



1 Phase—3 Wire—Distributed Phase
3 Phase—4 Wire—Distributed Phase
2 THROUGH 42 CIRCUITS

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY



A BEND IN LINE SAVES TIME...

Republic ELECTRUNITE® E.M.T. goes in fast

It goes in fast . . . and it goes in to stay.

Even after ten . . . fifteen . . . twenty . . . twenty-five years of service, utilities report that Republic ELECTRUNITE E.M.T. is still providing trouble-free protection for their electrical systems. And in concrete jobs, where hundreds of millions of feet have been installed, results are equally good.

Fast installation is another of Republic ELECTRUNITE E.M.T.'s big advantages. A longitudinal Guide-Line helps keep bends in the same plane, avoid costly delays. There's no kinking . . . no wrinkling . . . even when bends are a full 90°—because ELECTRUNITE is *uniformly ductile.* Furthermore, it's lightweight and easier to handle . . . which further reduces costs.

You get additional savings because there are no threads to cut, no runs to turn. Every joint becomes a union. And since threading is unnecessary, the tightly adhering galvanized coating remains unbroken—assuring permanent end-to-end circuit protection from corrosion.

Check further into the cost advantages of Republic ELECTRUNITE E.M.T.—the electrical circuit that provides many money-saving installation helps like the "Inch-Marked"® and "Guide-Lined" features. It's produced to ASA Specification C-80.3. Federal Specification WW-T-806 and carries the Underwriters' Laboratories Seal of Inspection. Write for all the facts. *Send for your free copy of 84-page ELECTRUNITE bending instruction booklet.*

REPUBLIC STEEL

Steel and Tubes Division

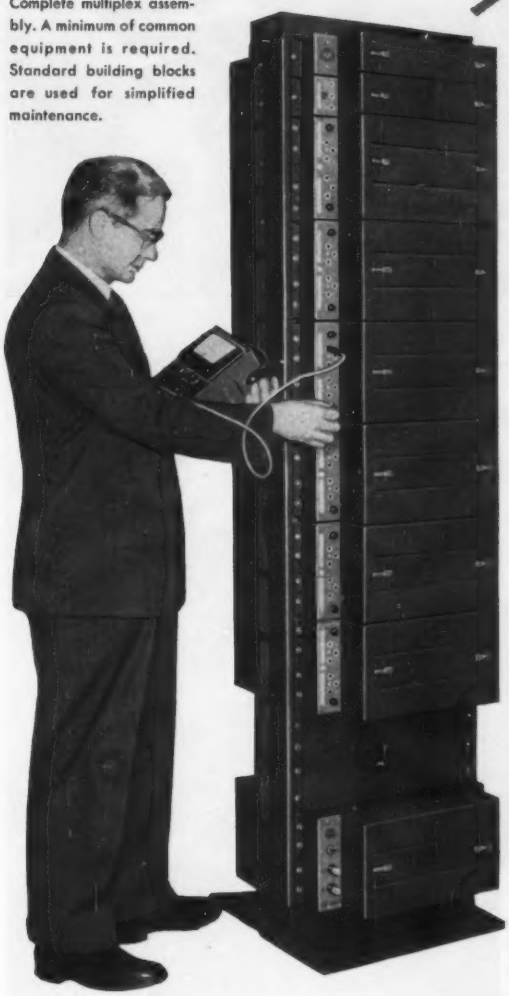
213 East 131st Street • Cleveland 8, Ohio

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

NOW... Big News in Microwave Multiplex Channeling Equipment!

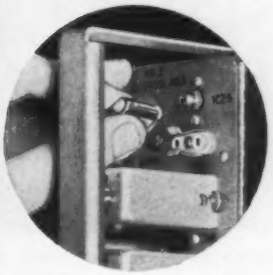
Complete multiplex assembly. A minimum of common equipment is required. Standard building blocks are used for simplified maintenance.



New RCA Type MV-124 with All Channel Units Identical and Interchangeable

Specifically designed for microwave use and thoroughly field tested, this new RCA Channeling Equipment provides complete flexibility. Frequency selection is by means of a plug-in crystal. Except for this crystal, *all Channel Units are identical and interchangeable*, thus simplifying planning, installation and maintenance.

Whatever your channeling requirements, these famous quality Channel Units can be easily stacked to provide two channels, three channels, or up to 24 voice channels without group modulating. High capacity systems can be obtained by stacking 24 channel groups. One unit is required for each voice channel desired. Single sideband suppressed carrier techniques are used to supply 24 channels in the band between 10 kc and 130 kc frequency, leaving frequency space for 18 tone channels below 10 kc. Simultaneous transmission of many channels of intelligence is accomplished by modulating separate sub-carriers spaced uniformly throughout the base-band modulating system. Channels are spaced one above the other in the available modulating band width.



To change channel assignment, simply change one plug-in crystal.

CRYSTAL CONTROL assures high stability and greater accuracy. For operations such as frequency shift telegraph and facsimile transmissions, an unusually high degree of clarity is attained.

DOUBLE HETERODYNING enables all circuits in all units to be identical except for the plug-in crystal element.

SINGLE SIDEBAND OPERATION enables each channel to use a minimum of spectrum space. This means less obsolescence due to possible congestion of the available microwave spectrum.

RCA Microwave . . . performance-proved in more than a million channel miles of operating systems throughout the world.

RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Nation-wide services of the RCA Service Company are provided to keep entire system operating at its peak. Mail coupon for further particulars.

RADIO CORPORATION of AMERICA
COMMUNICATIONS PRODUCTS
Camden, N. J.

Radio Corporation of America
Communications Products, Dept. MB-45, Building 15-1, Camden, N. J.

Please send me the latest literature on:

- ☐ RCA Multiplex Channeling Equipment
- ☐ RCA Microwave for use in .....

Name ..... Title .....

Company .....

Address .....

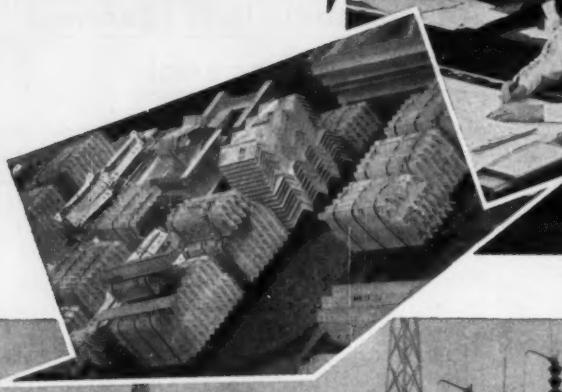
City ..... Zone ..... State .....

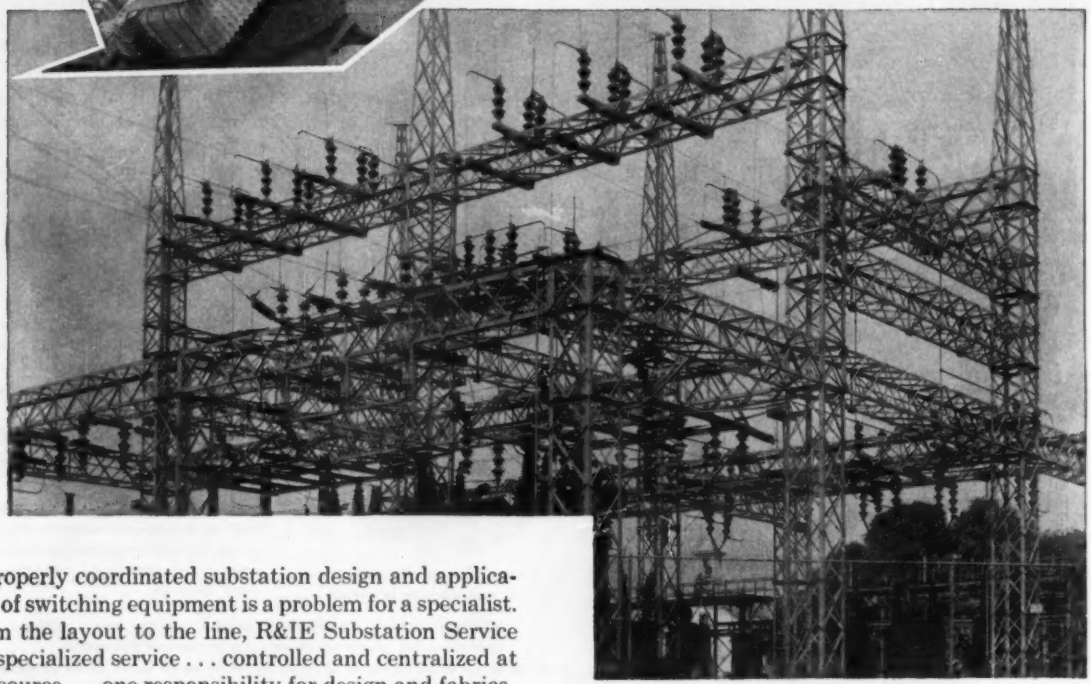
☐ Have representative contact me.

SUBSTATION SERVICE *features*

One Responsibility

from design to delivery . . .





• Properly coordinated substation design and application of switching equipment is a problem for a specialist. From the layout to the line, R&IE Substation Service is a specialized service . . . controlled and centralized at one source . . . one responsibility for design and fabrication, and for the application of Blade Switching Equipment.

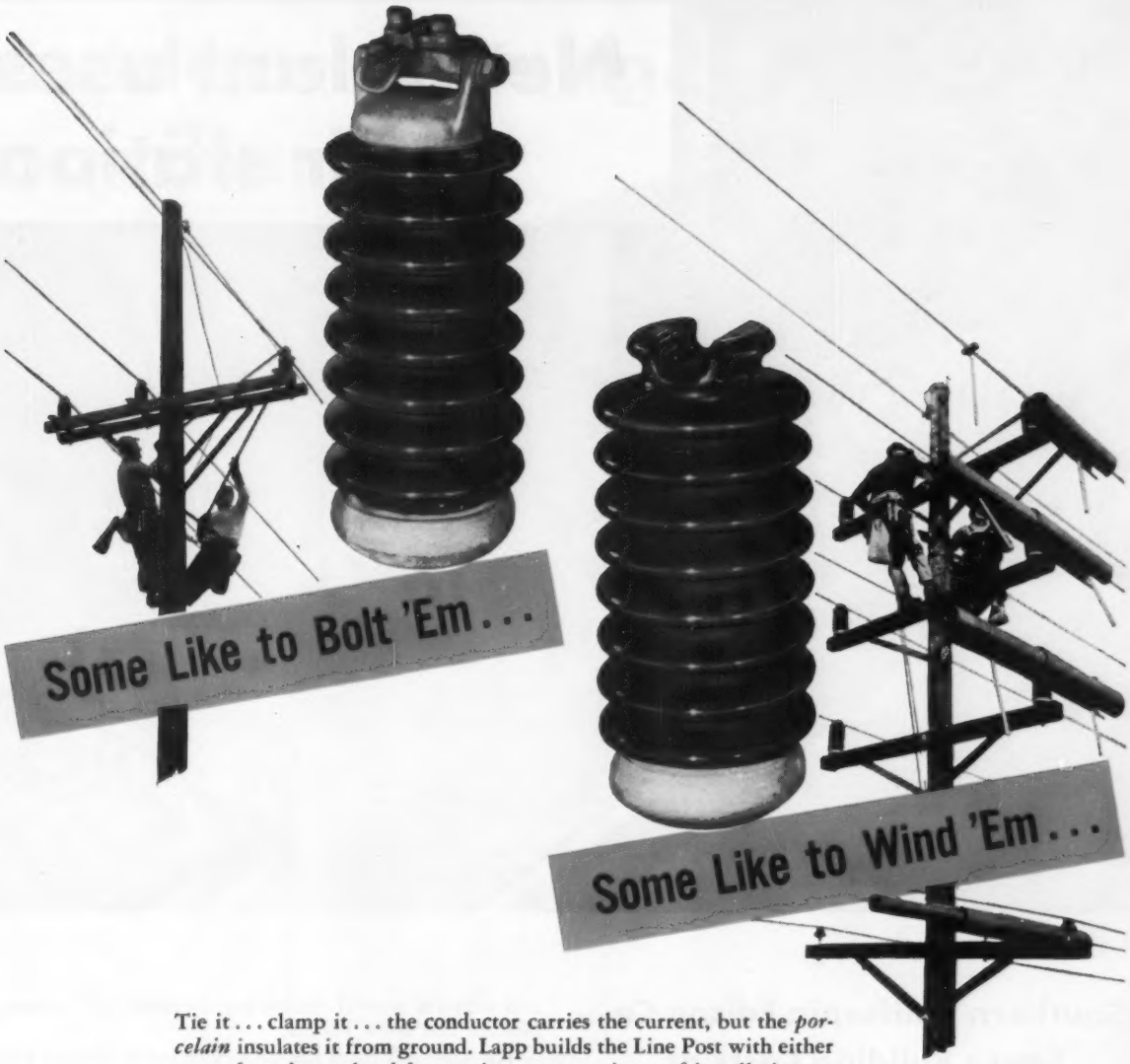
• R&IE ability—the result of almost a half-century of dependable experience—produces a mechanically and electrically correct substation installation—steel or aluminum type.

R&IE

R&IE EQUIPMENT DIVISION

I-T-E Circuit Breaker Co.

GREENSBURG, PENNA.

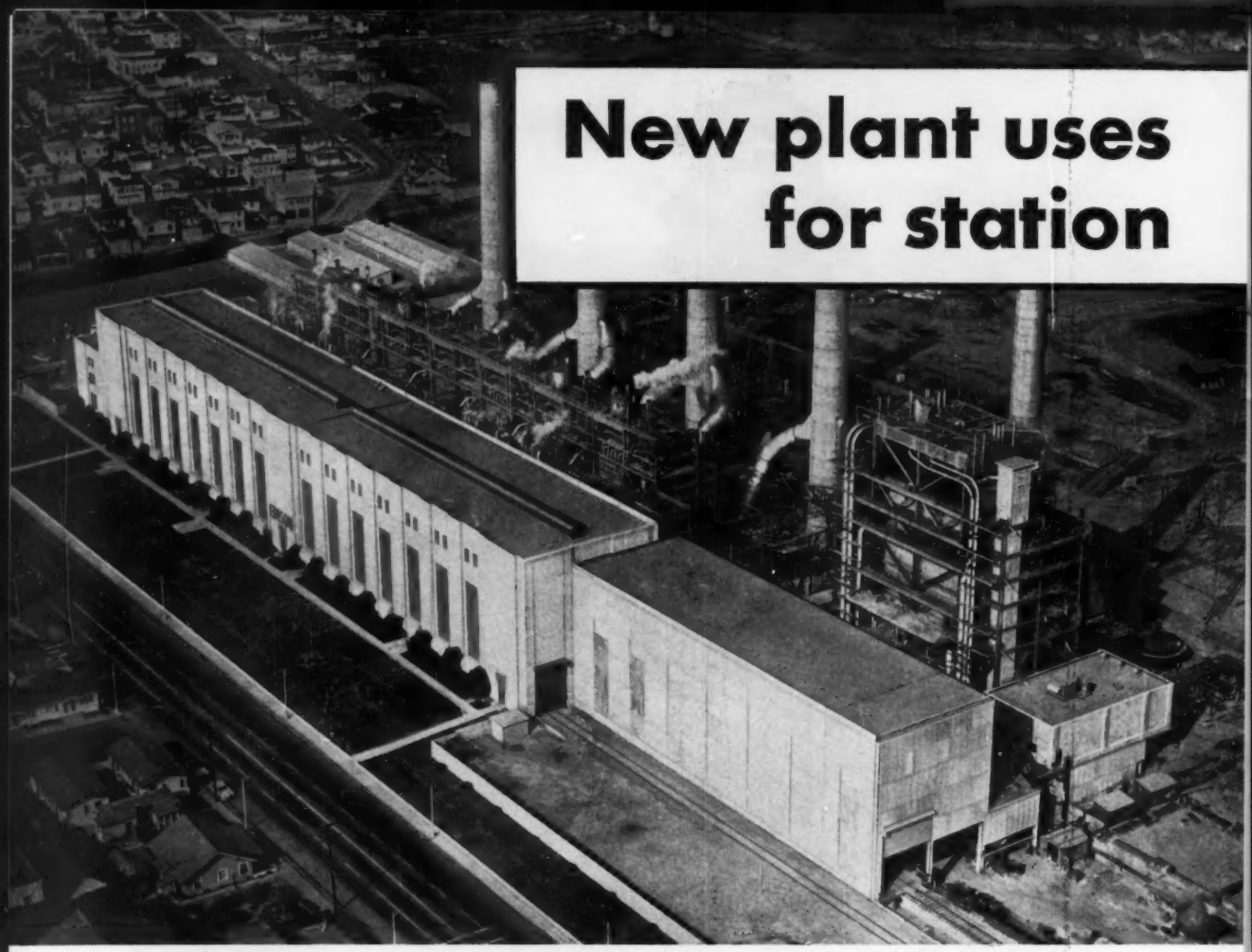


Tie it . . . clamp it . . . the conductor carries the current, but the *porcelain* insulates it from ground. Lapp builds the Line Post with either type of conductor head for maximum convenience of installation . . . and it builds the *porcelain* to do the *insulating* job. The porcelain in either case is a closed-end post, of high density vacuum-process electrical porcelain. It won't puncture because it has no conductive material within it. It outperforms any other type of insulator in dirt conditions because its fog-type design prevents leakage flashover from non-uniform leakage resistance. It stands up under arcover, stones and bullets because its short, sturdy petticoats protect the body. And it won't crack because its hardware, both top and bottom, is *externally* attached, and can load porcelain only in compression.

With tie-wire or clamp-top, the Lapp Line Post will give you an *extra* margin of operating security, low upkeep, long life.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



New plant uses for station

Southern California Edison Co. Saves Building Costs at New Redondo Station

Cut costs . . . maintain power continuity! These were the big considerations at Southern California Edison Company. The use of outdoor station auxiliary switchgear helped in cutting overall costs. And the carefully planned circuit schemes described here help in maintaining continuity of service for the station auxiliaries.

First step in assuring power continuity was setting up two independent power sources for auxiliaries.

(1) *An auxiliary generator direct-connected to the main generator shaft.* Supplies main auxiliaries during normal operation . . . provides a power source independent of system disturbances.

(2) *A local 69-kv line through a step-down transformer bank.* Provides a reserve and start-up source, and supplies general station requirements such as soot blowers and spare exciter.

The 4160-volt main station service bus is divided into East and West bus connected through a bus section breaker. Each section supplies about half the auxiliary power requirements. If either bus is removed, approximately 65% capacity can be maintained.

The Allis-Chalmers outdoor 4160-volt switchgear is rated at 250,000-kva interrupting capacity and is physically split as indicated by the one-line diagram. Three types of protection are provided: overload, undervoltage and fault.

Motors are tripped off the line and an alarm is sounded if heavy overload occurs. No alarm is given on light overload.

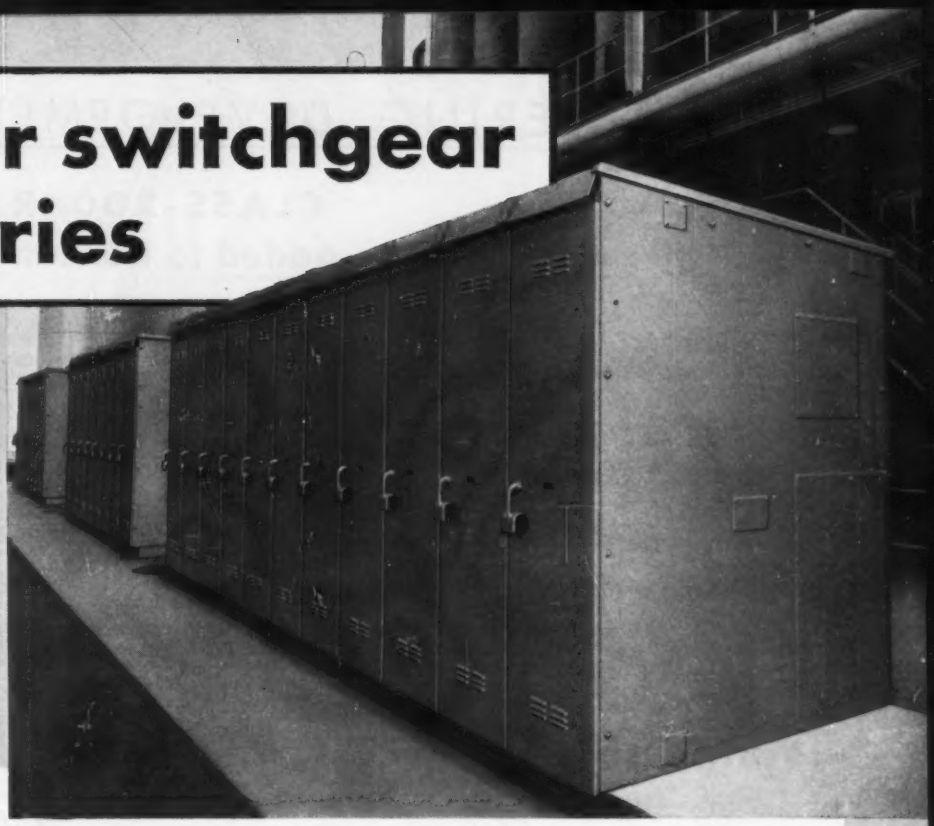
An undervoltage condition on main bus (East and West buses combined) will initiate an automatic throwover from the auxiliary generator to the reserve supply.

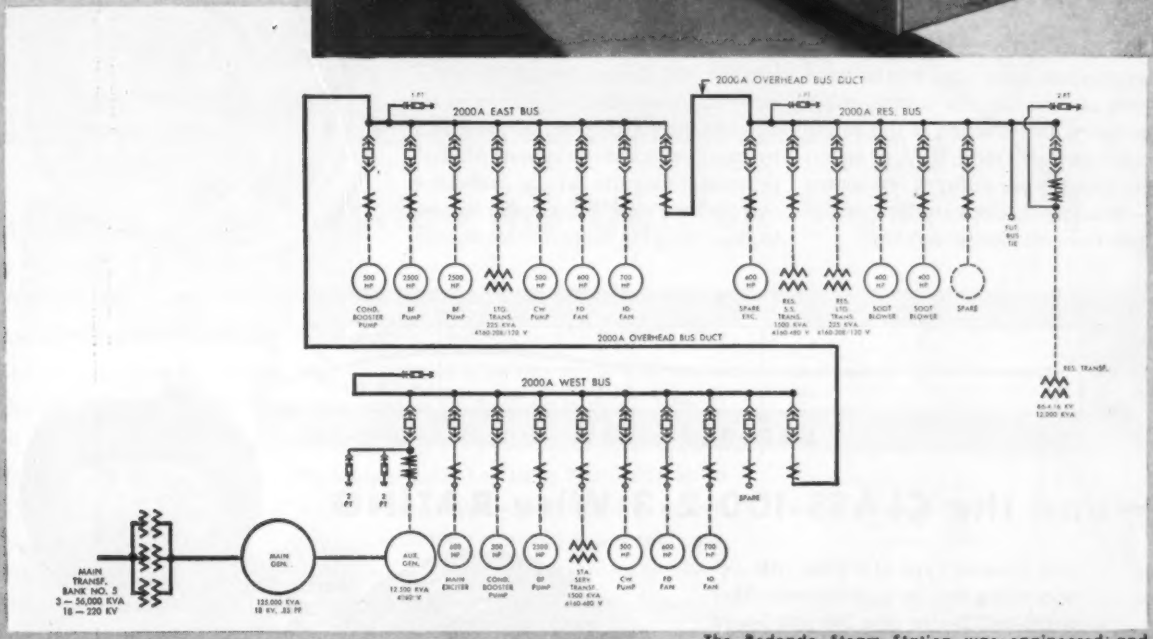
In the event of a fault in the generator circuit or in the generator, provision is made for automatic transfer from auxiliary generator to reserve source.

for Progress in Switchgear **ALLIS-**

outdoor switchgear auxiliaries

Allis-Chalmers engineers worked in close cooperation with Stone & Webster Engineering Corporation and Southern California Edison Company engineers on this project. It is one of many station auxiliary switchgear lineups built by Allis-Chalmers. For an answer to your switchgear problems, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.





The Redondo Steam Station was engineered and constructed by Stone & Webster Engineering Corporation.

If there's a fault on either the East or West bus, the section is automatically isolated so disturbances will be kept to a minimum.

During normal operations it is possible to transfer to the reserve supply by first opening the normal supply — then closing the reserve bus tie.

To provide added flexibility there is also provision for make-before-break manual transfer from normal to reserve power supply by closing the reserve bus-tie breaker, after synchronizing the two sources of power, and then opening the normal supply breaker.

CHALMERS

A-C ALLIS-CHALMERS

A-5217

METERING DEVELOPMENTS

CLASS-200 RATING
Added to Duncan MK Line

● Another step in the completion of Duncan's line of Type MK singlephase meters is the addition of the Class-200 rating. This meter, with adequate capacity for measuring continuous loads to 200 amperes, fits in with the present trend to larger services for handling tomorrow's load. Duncan pioneered the Class-200 rating with the Type MF-SE meter, introduced over seven years ago. This new MK rating offers improved performance plus all the features of the Duncan MK singlephase line.

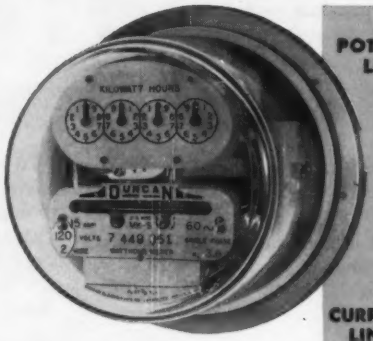
-joining the CLASS-100 RATING

The Class-100 general purpose MK singlephase meter is now in its third year of service to the electric utility industry. Introduction of this rating made available more KVA of metering capacity per dollar of investment —thus helping electric utilities maintain low-cost electric service.

More dependable performance is built into the MK design through the use of molded, arc-resistant insulation in the electromagnet; self-contained arc gaps to by-pass electrical disturbances; Alnico V permanent magnets to resist calibration changes; and many other design features to assure long life with low maintenance.

-and the CLASS-100 2-3 Wire RATING

The Duncan Type MK Class-100 2-3 wire rating may be used to meter either a 120-volt 2-wire or a 240-volt 3-wire service. The meter is quickly converted from one type of service to the other by moving two links—see illustrations at the right. This type of meter is particularly applicable where new 2-wire meters are needed now but would be obsoleted as soon as services are changed to 3-wire.



POTENTIAL LINK

Moved to the left for 120-volt 2-wire. Moved to the right for 240-volt 3-wire.

CURRENT LINK

(*Advertisement*)

DUNCAN ELECTRIC COMPANY, INC., Lafayette, Indiana

3 Legs Make Twice the Derrick

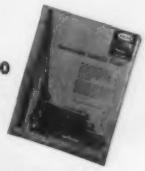
With Holan's three-legged derrick, you are ready for any job at a moment's notice... butt-pulling... body-loading... extra-heavy lifts.

The integral third leg means crews won't have to sit idle while a separate third leg is being attached. And the integral third leg gives extra strength to provide a wider and safer working range.

This derrick was designed to do more than it has to. It lifts loads up to 12,000 pounds, poles 75 feet long . . and has been load-tested at 22,000 pounds. For body loading, it hoists up to 5,000 pounds of equipment over the rear axle. Working range is 195° — the derrick head lowering to within five feet of the ground. Two levers at the rear of the truck body hydraulically control the derrick and live boom.

There's nothing else in the field like Holan's Series 3700 Live-boom Power Derrick.

Write for the Series 3700 catalog.



J.H. HOLAN CORPORATION

4100 WEST 150TH STREET
CLEVELAND 11, OHIO

OTHER PLANTS:
HOLAN CORPORATION OF GEORGIA, Griffin, Ga. • J. H. HOLAN CORP., Phoenix Div., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

Bodies for truck driven air compressors. Designed to accommodate hose reels, tapping machines, jack hammers, etc.

Service bodies for chassis up to 1½ ton. Lengths, 72", 75", 84", 90" and 102".

Hydraulic Derricks designed for front or rear mounting. Capacities to 12,000 lbs.

Light-duty power operated derricks for front or rear mounting. Operating range of 146°.

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

Mechanical Ladders expertly engineered and counterbalanced for effortless handling. Maximum heights from 23' to 40'. Swings 360°; angles to 72°.

Portable hydraulic and mechanical earth borers. Augers for 8" to 20" diameters, depth to 8'.

Wide variety of pole and reel trailers. Standard and special. Many optional features.

Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

NEW CLARK CONTROL CENTERS CAN SAVE YOU ONE VERTICAL SECTION FOR EVERY FIVE!

features:

- SPACE SAVING
- SIMPLER MAINTENANCE
- GREATER VERSATILITY
- MAXIMUM SAFETY
- STRONGER and MORE RIGID

plus!

- CLARK TYPE "CY" STARTERS, OF TIME PROVEN SUPERIORITY

WRITE for your copy of this informative book containing complete information for adapting the new CLARK space-saving CONTROL CENTERS to your needs.

and each section is only 20 inches wide!

You *save space* two ways with new CLARK Control Centers—vertical sections are only 20" wide, and each vertical section can house up to 6 size 1 or 2 non-reversing combination starters. Thus 30 starters can be accommodated in 5 sections—total width only 100 inches—compared with 6 sections of ordinary 5-unit design and considerably greater width. *Maintenance* is easier because all wiring and service—even bus replacement—is from the front or top. Parts are standardized for greatest *versatility* and *flexibility*—making it simpler to adapt units to particular needs or alter arrangements after installation. For *maximum safety*, all bus is completely enclosed and empty compartments are protected by insulating barriers and closure panels. Heavy gauge steel plus exclusive design providing support for all load bearing members without dependence on shear strength of screws, assures added *strength* and *rigidity*.

The **CLARK** **CONTROLLER** *Company*

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

46

POWER COMPANIES SELECT INGALLS

- Alabama Power Company
- Arkansas-Missouri Power Company
- Arkansas Power & Light Company
- Boston Edison Company
- Carolina Power & Light Company
- Central Hudson Gas & Electric Corporation
- Central Illinois Public Service Company
- Central Louisiana Electric Company, Inc.
- Cia Cubana Electricidad
- The Cincinnati Gas & Electric Company
- City of Jacksonville, Florida
- City Public Service Board — San Antonio
- The Cleveland Electric Illuminating Co.
- Columbus & Southern Ohio Electric Co.
- Consolidated Edison Company
- Consumers Power Company
- Duke Power Company
- Electric Energy, Inc.
- Florida Power Corporation
- Florida Power & Light Company
- Georgia Power Company
- Gulf Power Company
- Hartford Electric Light Company
- Indiana & Michigan Electric Company
- Indiana-Kentucky Electric Corporation
- Jersey Central Power & Light Company
- Kentucky Utilities Company
- Long Island Lighting Company
- Louisiana Power & Light Company
- Mississippi Power Company
- Mississippi Power & Light Company
- Monongahela Power Company
- Montaup Electric Company
- Ohio Edison Company
- Ohio Power Company
- Pacific Gas & Electric Company
- Pennsylvania Power Company
- Philadelphia Electric Company
- Public Service Company of Indiana
- Rockland Light & Power Company
- South Carolina Electric & Gas Company
- South Carolina Public Service Authority
- Southwestern Gas & Electric Company
- Tennessee Valley Authority
- The Tucson Gas, Electric Light & Power Co.
- Western Massachusetts Electric Company

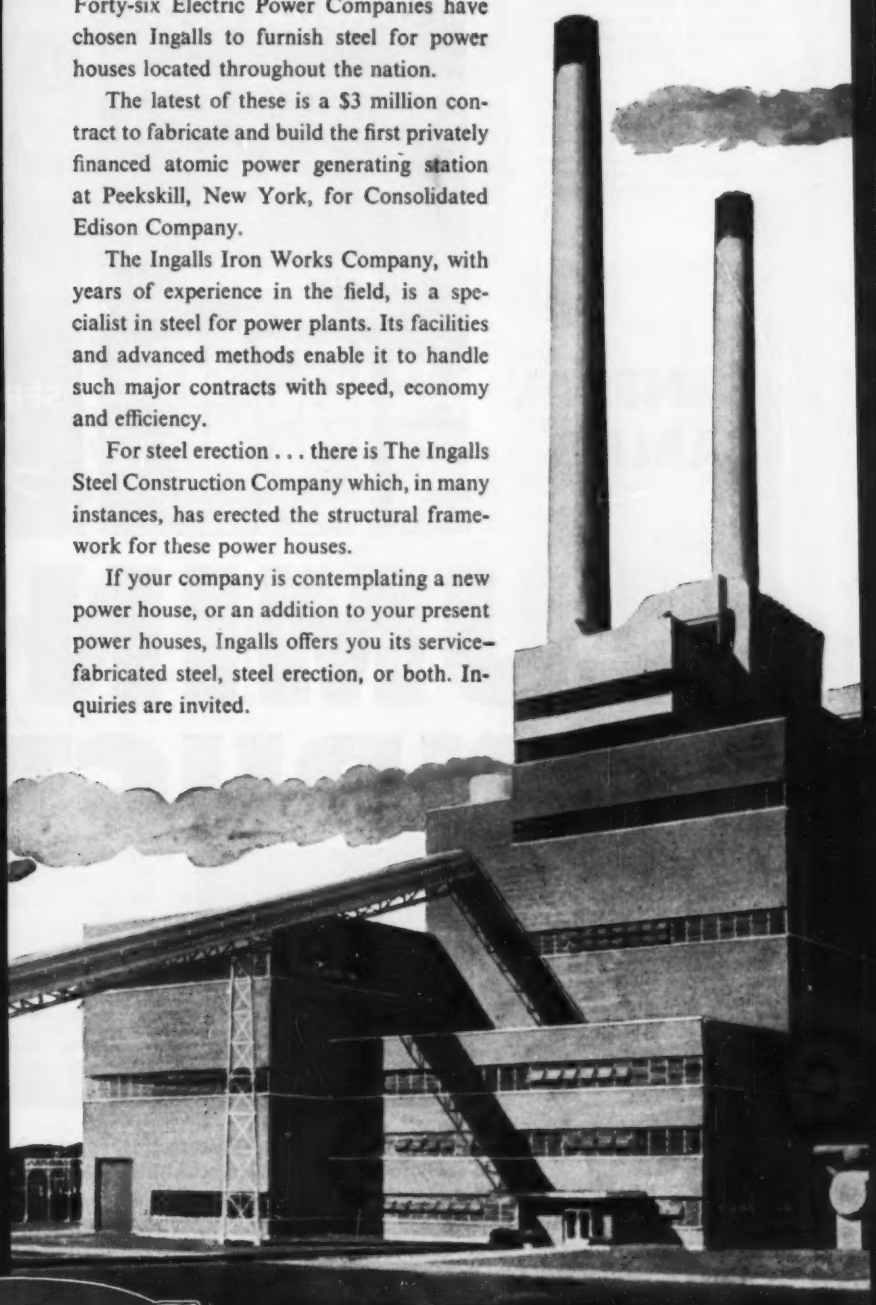
Forty-six Electric Power Companies have chosen Ingalls to furnish steel for power houses located throughout the nation.

The latest of these is a $3 million contract to fabricate and build the first privately financed atomic power generating station at Peekskill, New York, for Consolidated Edison Company.

The Ingalls Iron Works Company, with years of experience in the field, is a specialist in steel for power plants. Its facilities and advanced methods enable it to handle such major contracts with speed, economy and efficiency.

For steel erection . . . there is The Ingalls Steel Construction Company which, in many instances, has erected the structural framework for these power houses.

If your company is contemplating a new power house, or an addition to your present power houses, Ingalls offers you its service–fabricated steel, steel erection, or both. Inquiries are invited.



FABRICATING STEEL IS OUR BUSINESS

THE INGALLS

IRON WORKS COMPANY

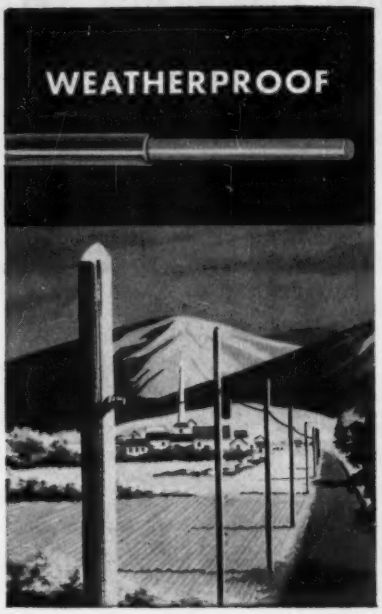
BIRMINGHAM, ALABAMA

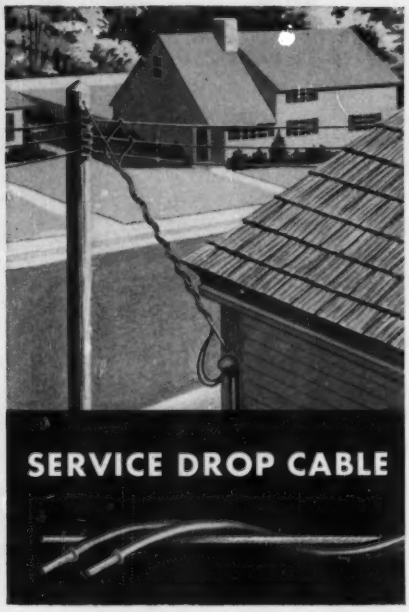
SALES OFFICES: New York, Chicago, Pittsburgh, Houston, Atlanta, New Orleans

PLANTS: Birmingham, Ala., Verona, Pa., North Birmingham, Ala., Decatur, Ala., Pascagoula, Miss.

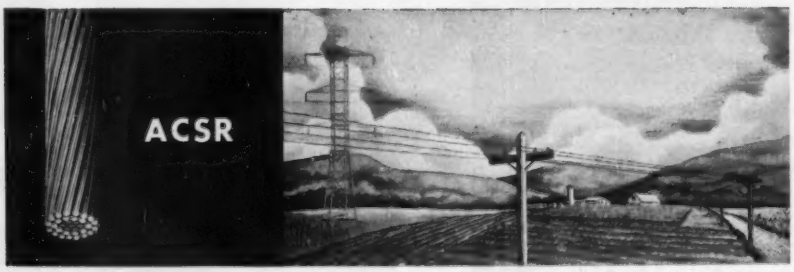
ALECTRAL

GENERAL CABLE'S





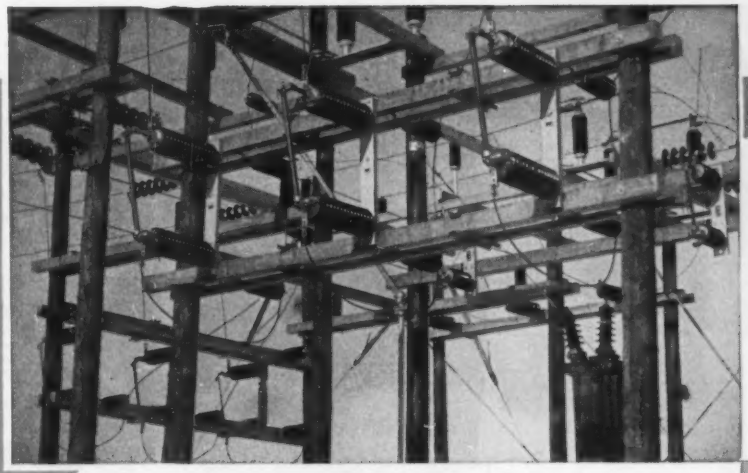
ALUMINUM CONDUCTOR



Built into its aluminum products are 75 years of General Cable's engineering and manufacturing experience. In this record are more than 25 years of successful performance of insulated aluminum conductors marketed as ALECTRAL. Available in ALL-ALUMINUM, ACSR, WEATHERPROOF and with RUBBER and THERMOPLASTIC insulations. A sound and economical investment for all voltage ranges.

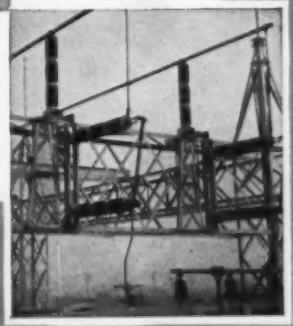
GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast

for quality and service . . . specify **GENERAL CABLE**



MAINE—The 69 kv B Series Power Fuses shown at the left are in service for Maine Public Service Company at Presque Isle.

TEXAS—Below are some 138 kv Type HMH-1 Power Fuses in service at a Texas utility's substation. The Type HMH-1 is available in interrupting ratings up to 30,000 amps.



SOUTHERN STATES POWER FUSES SAVE UTILITIES UP TO $45 EACH TIME A FUSE BLOWS

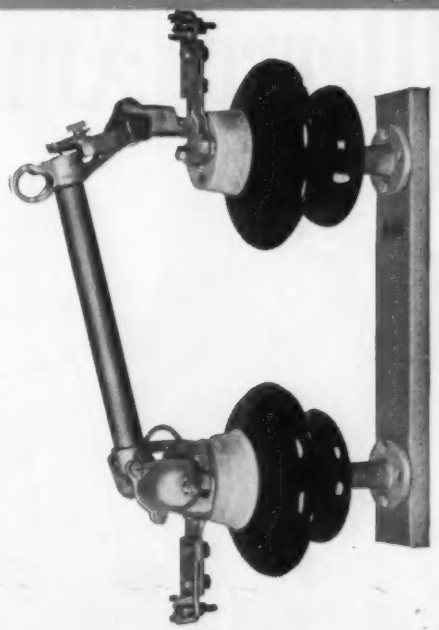
How much does it cost your company when a power fuse blows? Seventy cents to $3, or $5 to $50? By using inexpensive links instead of costly refills, Southern States power fuses may cut re-fusing costs as much as 800%.

There are additional savings, too. In a matter of minutes a lineman can re-fuse the unit, saving valuable time. No factory servicing is necessary. Expensive stocks of spares are eliminated. Less storage space is required. These all add up to savings too sizable to overlook. That is why utilities coast to coast are using Southern States Power Fuses.

These full dropout fuses are available to meet most requirements: Voltage ratings from 7.5-161 kv, continuous current ratings from 50-400 amps, and interrupting ratings up to 30,000 RMS amps. *Southern States Power Fuses have the highest interrupting capacity of any expulsion type fuse.*

They are not simply oversize cutouts, but have high mechanical strength to assure perfect performance for years, even after repeated operation. Snubber action allows the fuse holder to swing down to a cushioned, shock-free stop. Double-venting reduces shock force on insulators. Interchangeability of tubes permits increases in continuous current and interrupting ratings without changing fuse mountings.

Count the savings, check the advantages, and see why it will pay to use Southern States Power Fuses on your system.



SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

G. M. RUOFF
Pres. & Gen. Mgr.
D. A. CRYTZER
Sales Eng.
T. R. FRY
Chief Eng.
F. A. ROSE
V. P. of Mfg.
Merry Xmas!
— and like the cascade of confetti
at this festive time of the year
our wishes for a peaceful and prosperous
New Year are borne on the winds
to our many far flung friends.
H. L. ELLIOTT
Sales Mgr.
D. WINGROVE
Sales Eng.
PP
INC.
Porcelain Products, Inc.
High Voltage Division
Parkersburg, W. Va.

INSTRUMENT TRANSFORMERS

Flexibility for growing loads

For load growth to 800 amperes, Sangamo Type R Transformers ... either with or without enclosures ... give needed flexibility.

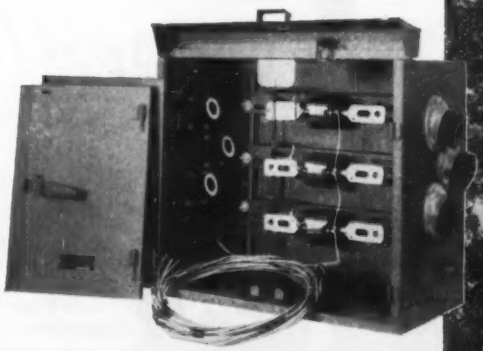
Pre-wired Metering Units usually consist of a pole top enclosure for transformers and an eye level metering unit with test switches, for either primary or secondary installation.

Transformer-Meter Mounts are single units, with both transformers and either socket or bottom connected meter, for secondary service only.

These factory assembled units eliminate the costs of "on the job" internal wiring and assembly.

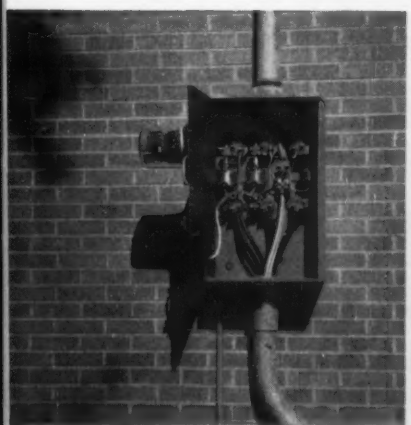
Ask your Sangamo Representative or write us for Bulletin 570 for detailed information on these economical transformer metering units.

SANGAMO ELECTRIC COMPANY, Springfield, Illinois

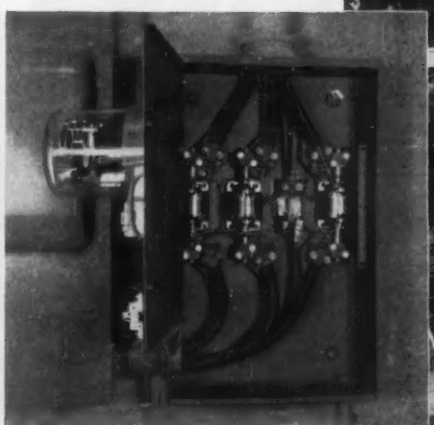


Sangamo pre-wired metering unit transformer cabinet for secondary metering of three-phase 4-wire circuits. Cabinet contains Type RF-6A Current Transformers.

Pre-wired Metering Unit—a typical convenient and economical installation.



Outdoor-installed Sangamo Transformer-Meter Mount. All necessary components and connections are contained within the factory-assembled unit.



Indoor-installed Transformer-Meter Mount with bottom connected meter and test switch.

SM56-10

WHY SPECIFY WESTINGHOUSE POWER BREAKERS?

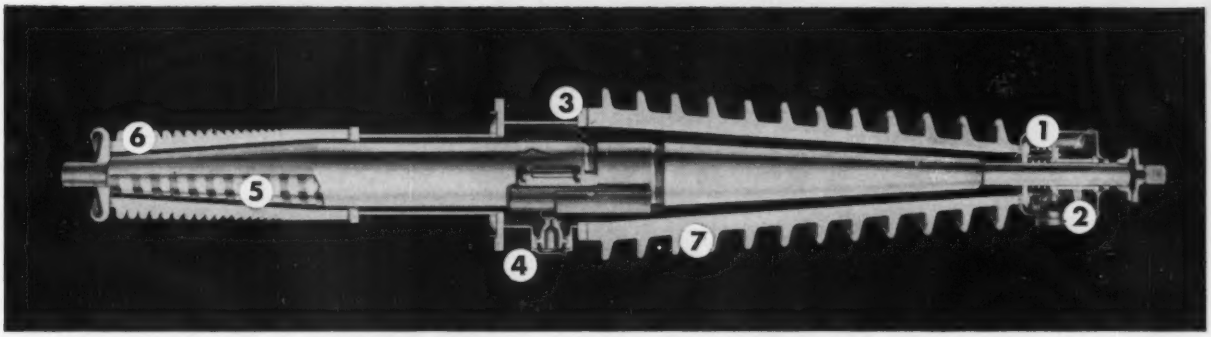
Look to Condenser Bushings for One Good Reason

Demands on power equipment have reached astronomical proportions—breaker interrupting capacity to 25,000,000 kva. Only Westinghouse has the background and experience to meet and exceed these demands. Only Westinghouse, pioneer of the condenser principle, has designed, built and improved condenser bushings for 50 years.

Industry recognition of condenser bushing design has led to the new ASA standards for equipment voltages from 23 to 69 kv—patterned after the Westinghouse Type "S". Standardization committees will soon release specifications for bushings in the Type "O" range—and again the Westinghouse design will play a major role in the development of these standards.

Some cutaway details of Westinghouse condenser bushings are shown on the facing page. For further information, call your Westinghouse sales office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60898

These Westinghouse GW power breakers, in the 330-kv rating, are equipped with Type "O" condenser bushings.



AT HIGHER VOLTAGES, long-term dependability is assured with Type "O" Bushing

The Westinghouse bushing has more total insulation strength than bushings of any other design or type of manufacture. Vacuum oil impregnation of condenser insures insulation with the highest possible dielectric strength in a minimum of space. 1. Compression spring assembly—spring cap applies tons of pressure to maintain tight seals on gasket joints; uses porcelain in compression, where strongest. 2. Inert gas space. 3. All seals are double gasketed—a hard, neoprene-asbestos outer stop gasket prevents over-compression of the resilient neoprene cork sealing gasket. 4. Exclusive Westinghouse tap—preserves full bushing insulation strength at all times. 5. Concentric foil layers. 6. Lower porcelain. 7. Porcelain weather casings protect all Westinghouse bushings.

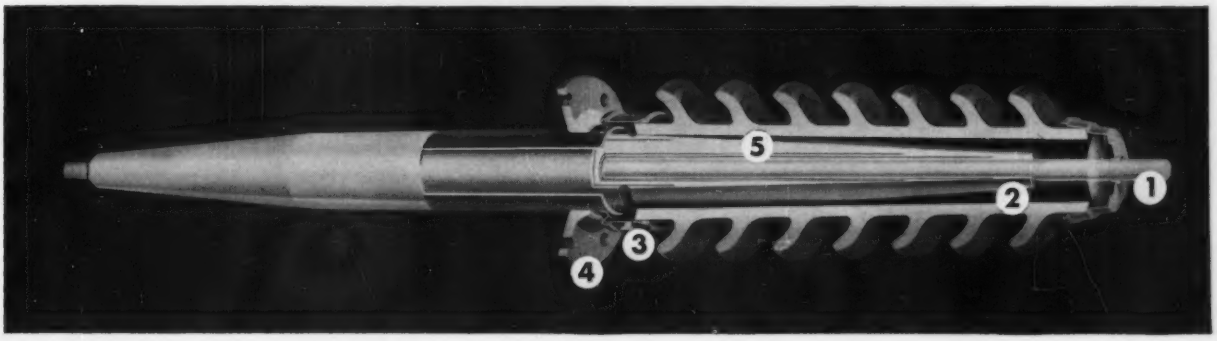
YOU CAN BE SURE...IF IT'S

Westinghouse

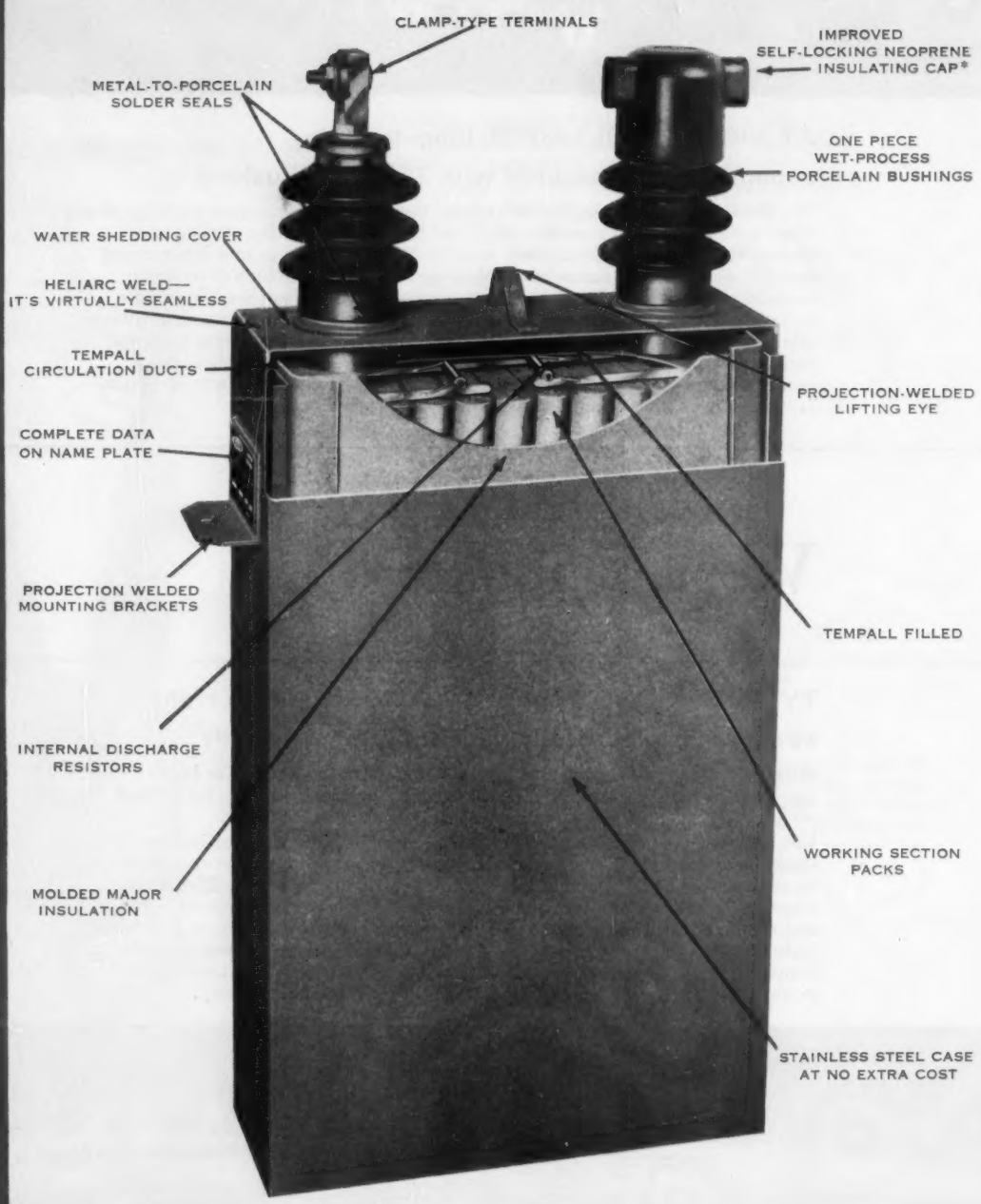
TYPE "S" CONDENSER BUSHING achieves highest strength . . . electrically, thermally, mechanically

With industry-wide bushing standardization, interchangeability for both transformers and breakers reduces spare parts stock requirements for voltage classes 23 through 69 kv and in current ratings up to 1,200 amps.

You can measure extra standards of performance in the many Westinghouse features shown here. 1. ASA standard terminal stud. 2. Between insulation and porcelain on the external end of the bushing, is an exclusive, high-viscosity filler plastic, which is impervious to moisture, prevents voids under all temperature conditions, and retains at all times a complete bond with all insulating members. 3. Power-factor test terminal—originated by Westinghouse. 4. ASA standard mounting flange. 5. Continuous condenser foil layers—minimum dielectric heating, lower power factor, no insulation hot spots, over-all high thermal capacity.



TOBE invites you to lo



ok inside the capacitors . . .

BEFORE YOU BUY A HOUSE, you look a lot farther than the color of the bathroom tile. You find out how the house is really constructed!

It's smart to be just as thorough when you buy capacitors.

Here are other TOBE *features which assure efficiency and long life in* TEMPALL CAPACITORS

- *Constant quality control of individual units during manufacture, processing and tests.*
- *Each unit visually inspected during manufacturing cycle to insure complete impregnation.*
- *Special* TOBE *assembly control mechanism results in greater product uniformity.*

Because of low losses resulting from TOBE'S advanced engineering design and manufacturing technique you get more correction for your capacitor dollar.

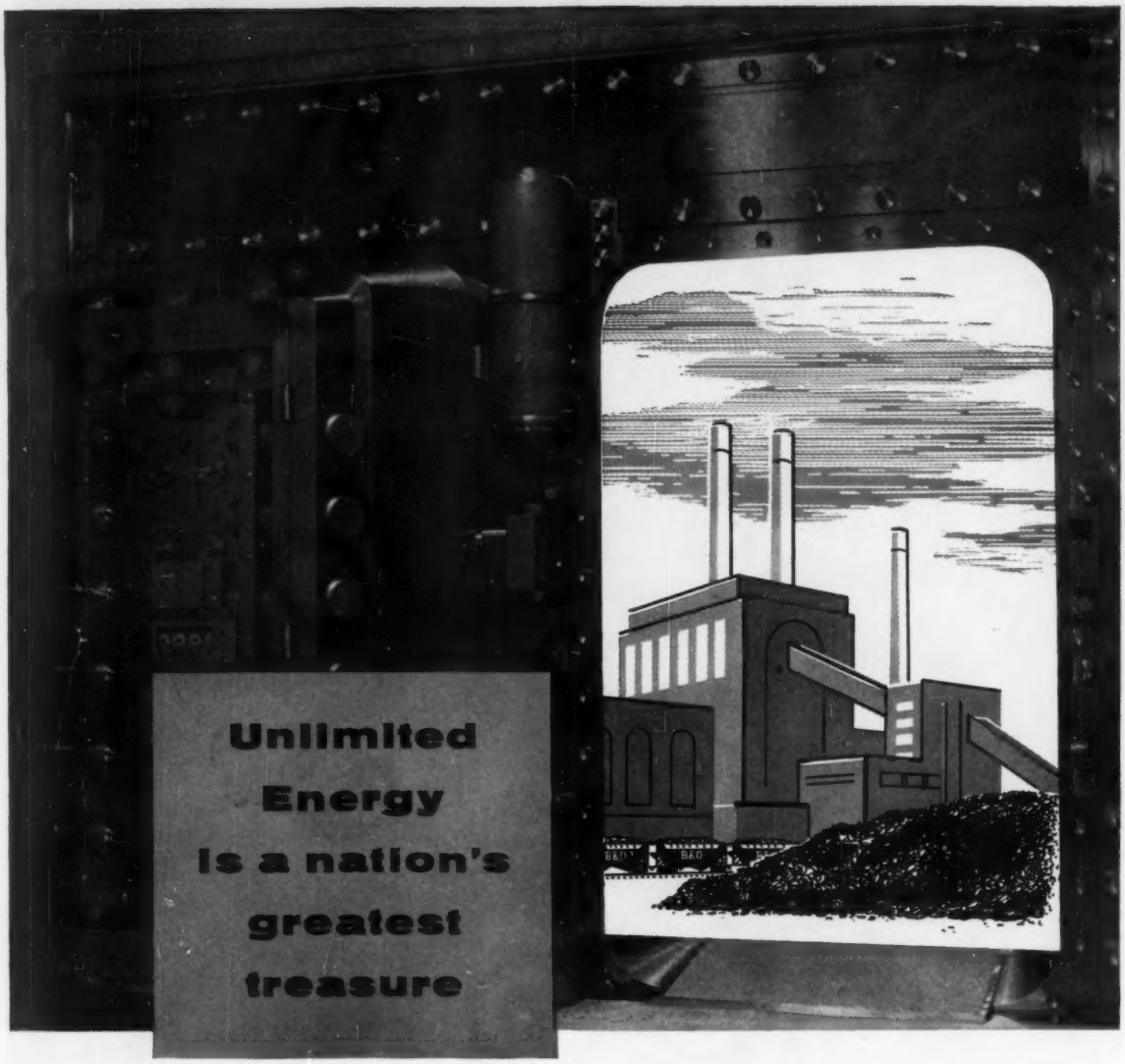
It will pay you to investigate TOBE capacitors today. Available in all standard ratings. In single units, racks, pole assemblies and complete cabinets ready for field installation and energization. Write Tobe Deutschmann Corporation, Norwood, Massachusetts or phone Norwood 7-2620, collect for further information today.

LOOK TO TOBE FOR PROGRESS

Since 1929 persistent research, trustworthy engineering, rigid production standards.

TOBE

TEMPALL CAPACITORS



Modern industrial might comes from nature's harnessed energy. This nation's greatest single energy resource is found in its tremendous reserves of Bituminous coal.

As population increases—as living standards rise, vast additional amounts of energy will be required—and found in Bituminous—*the fuel with a future.*

Fields served by B&O contain known reserves of more than 8 billion tons suitable for every purpose. The nation can safely *bank on bituminous* treasure like this and on B&O operators to mine and supply it in greatest quantities, with increasing efficiency at stable-low-cost. *Ask our man!*

Let our Coal Traffic Representative suggest a constant-low-cost Bituminous coal for your needs—
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BITUMINOUS COALS FOR EVERY PURPOSE

Congratulations!

. . . to the American Telephone & Telegraph Company upon the completion of the new Transatlantic cable linking Europe and America.

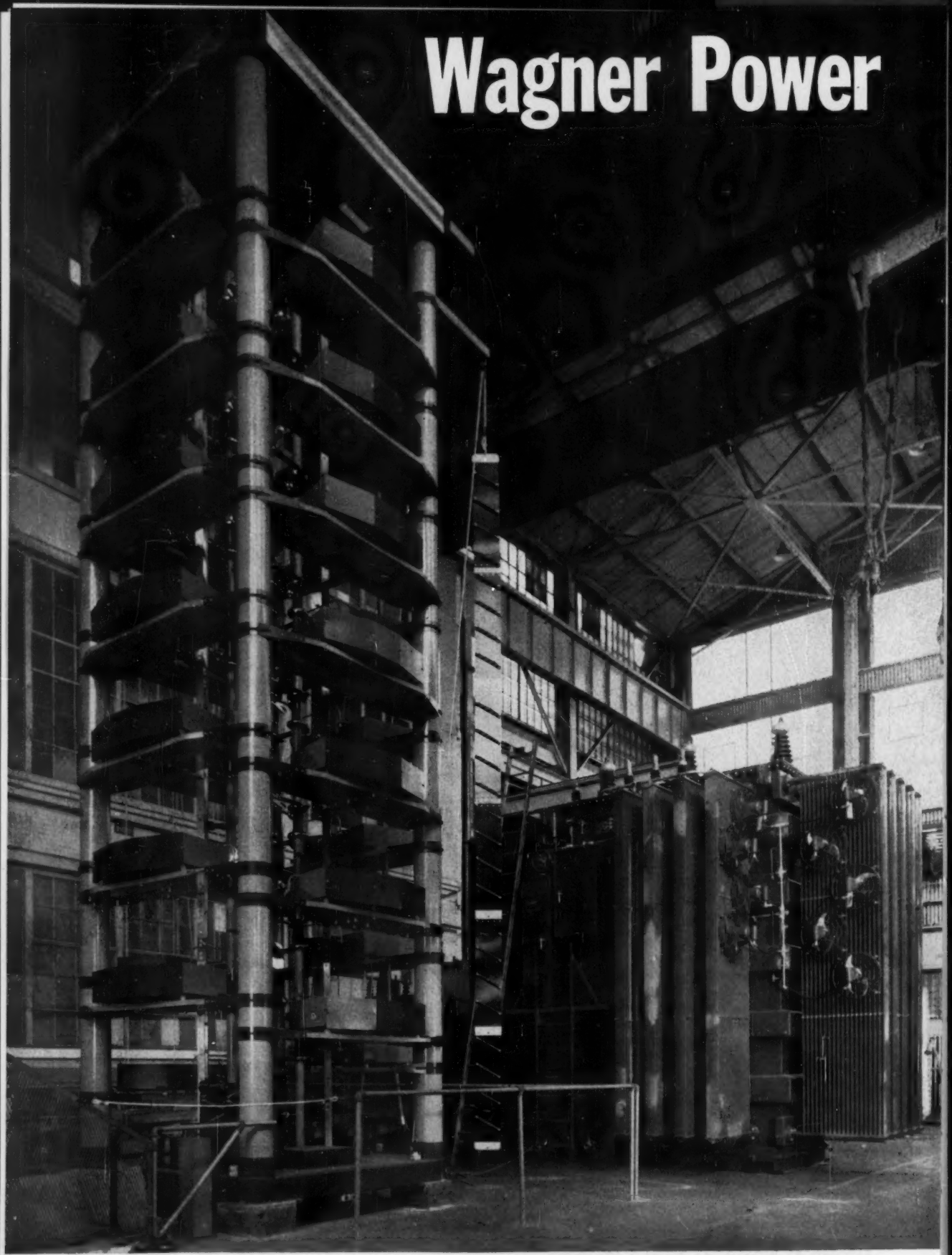
This engineering achievement, the result of cooperative American and British enterprise, signalizes a new era of greatly improved Transatlantic telephone service.

Simplex Wire & Cable Co., as manufacturer and supplier of the American-made part of the submarine cable used in this gigantic project, is understandably proud to have participated in this historic accomplishment, and in the development work which made it possible. **SIMPLEX WIRE & CABLE CO.,** 79 Sidney Street, Cambridge 39, Mass.

Simplex

Wires and Cables for:

Wagner Power



Impulse test being given to a new power transformer in the Wagner transformer plant. The 3 phase, 60 cycle transformer under test is rated 20,000/25,000/33,333 Kva forced air cooled.

Transformers

Designed—insulated—and tested to handle heavy voltage surges for assured power continuity

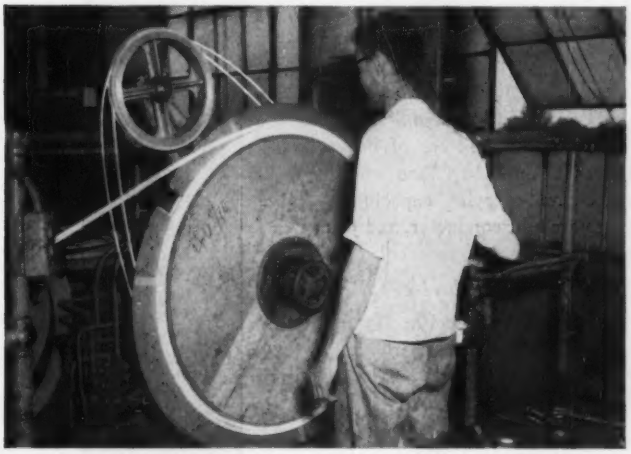
Wagner has been building power transformers for sixty-five years. The knowledge gained and the facilities acquired in all those years make the designing and building of fine power transformers part of the day's work at Wagner.

Wagner power transformers are designed and insulated to withstand practically any lightning or switching surge that might be encountered on a properly protected transmission line.

But, because heavy surges are the greatest enemy of transformer life, Wagner subjects every new design to rigid tests to make doubly sure that these transformers will provide the utmost reliability and service continuity.

Consult Wagner on your next power transformer installation. Thirty-two branches are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

Buffer coils are used at the ends of the high voltage windings for Wagner power transformers. They protect against surges by absorbing the first impact of any line disturbance.



The two coils forming one double disk section of a high voltage buffer coil are wound at one time on the same machine.

The buffer coils have extra cable paper insulation on the conductor. Each section is individually wrapped with insulating tape.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

More efficient connections all three ways...

BRAZED

CLAMP TYPE

BOLTED

Because it's SQUARE!

CHASE® VENTILATED SQUARE COPPER TUBE BUS CONDUCTOR!

Power gets a green light, even through the joints of Chase square copper tube bus! Those four flat sides have more than enough surface area for brazed, bolted or clamped connections to take a tight, highly conductive grip. Such firm and secure joints have high mechanical strength, too—withstand the distorting forces of heavy short-circuit current almost as well as beam-rigid Chase square tube bus itself! Add the increased current-carrying capacity of *cooler-performing*, ventilated Chase square tube conductor, and you have electrical main arteries second to none in performance!

Write for *free* Chase Bus Conductor Brochure *today!*

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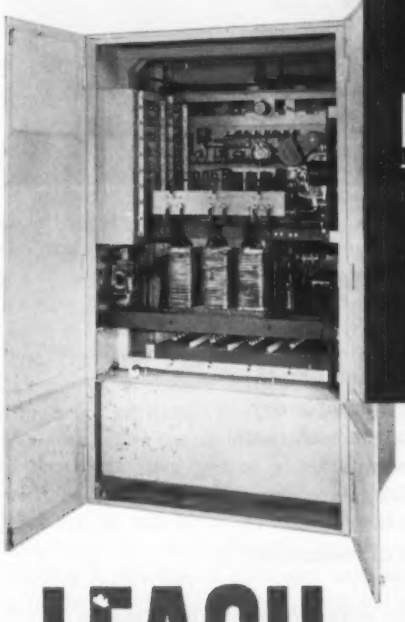
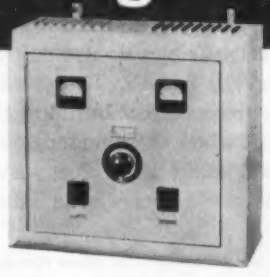
standby power...just sleeping...not dead

Yes, it's mighty quiet in most battery rooms, but if service continuity is to be maintained, every cell must be ready *at all times* to spring to immediate action. For dependable switchgear operation . . . and for railway signalling, alarms, communication equipment and the other applications where *positive performance* of storage batteries is vital . . . more and more utilities and industries are finding that INET-Palmer *Regulated* Battery Chargers are the best form of insurance. And, one of the least expensive. Completely unattended, they guard batteries against sulfation and discharge . . . make sure *24 hours a day* that standby power, on those rare occasions when it's needed, is always ready.



...thanks to INET-Palmer

regulated battery chargers



6 reasons why INET-Palmer regulated chargers are your BEST BUY...

COMPLETELY AUTOMATIC . . . operates unattended; no operator required.

DEPENDABLE . . . no moving parts or vacuum tubes used in circuits.

STABLE . . . less than ±1% variation from no-load to full-load despite ±10% *simultaneous* input variation.

EASY INSTALLATION . . . floor, wall, or panel models available.

WIDE RATING RANGE . . . 3 to 60 cells in ratings to 50 KW.

LOW OPERATING COST . . . nothing to wear out, nothing to maintain.

Send today for Bulletin T-1100 containing complete specifications.

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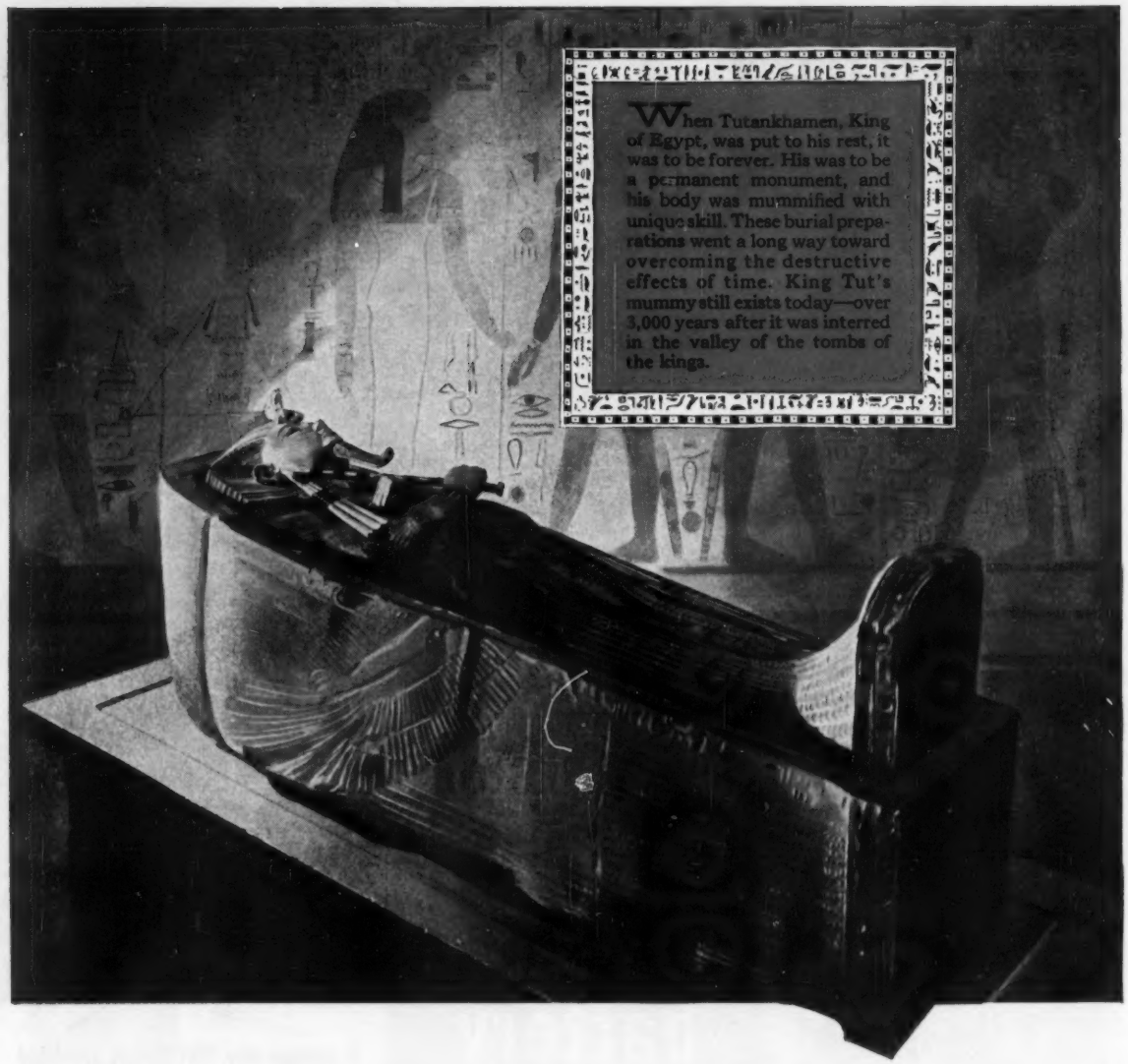
DISTRICT OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF U. S. AND CANADA


When Tutankhamen, King of Egypt, was put to his rest, it was to be forever. His was to be a permanent monument, and his body was mummified with unique skill. These burial preparations went a long way toward overcoming the destructive effects of time. King Tut's mummy still exists today—over 3,000 years after it was interred in the valley of the tombs of the kings.

Especially Built For Burial

Like King Tutankhamen's mummy, many Kerite Cables are especially built for long-time burial. But these Kerite Cables do not enjoy the favorable dry, almost air-tight conditions of King Tut's tomb. These cables must withstand all the adverse conditions encountered in direct burial in the ground from the Arctic to the Tropics. Yet when these underground cables are unearthed, even after years of service, they are, unlike King Tut, very much alive. The name Kerite is recognized, the world over, as the hallmark of endurance.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

The Hidden Warning in Reserve Margins

Predictions of the industry's gross reserve margin, contained in the latest Edison Electric Institute Semi-annual Power Survey, contains a hidden note of warning to power suppliers.

These predictions show that the industry's gross reserve margin, as a percent of winter peak load, will drop this December to 15.5%—the lowest level since 1952. And next December it will range even lower to 14.8% before climbing back to 20% by sometime in 1959.

In large measure this dip in reserve reflects the lag in orders for new generating capacity that took place in 1953-54. Of course, effects of the lapse have been accentuated by the Schoellkopf Station disaster and the Westinghouse strike. Manufacturers now estimate that this lapse in equipment orders has resulted in the loss of 5 to 7 million kilowatts of capacity. Moreover, they see it as the most recent manifestation of a 5-year cyclic fluctuation in order volume which they warn should not be permitted to continue.

Certainly it is true that today as generating equipment prices climb, steel shortages threaten, and reserve margins dwindle in the face of a tense international situation, those who bought time two years ago must be finding it tough to pay the bill.

Thoughts Over a Christmas List

Our commercial editor keeps a little statistical table framed on his desk. It's titled "Index of Saturation," and it lists the saturation of all the various electrical appliances.

"It's there," he told us, "because it keeps me conscious of the big opportunity that lies ahead."

With 13 shopping days remaining till Christmas our editor's comment and his little table showing that nearly three out of four appliances are in less than half our wired homes turned us to wondering. Why is it that people still gives ties, perfumes, stockings, socks when electrical appliances cost so little and make such welcome gifts?

Besides, we all have too many loud ties already!

A Professional Approach to a Professional Problem

In sponsoring the first searching and comprehensive self-survey of the engineering profession ever to be undertaken, the Engineers Joint Council and the Engineers' Council for Professional Development have taken forthright and commendable action to solve major problems confronting the profession.

The explosive pace of scientific advancement today and the engineers' obligation to render it useful to mankind have imposed broad and unusual responsibilities on the profession. As a result, critical problems have been created in professional education, utilization of manpower, organization and registration as well as social and economic factors.

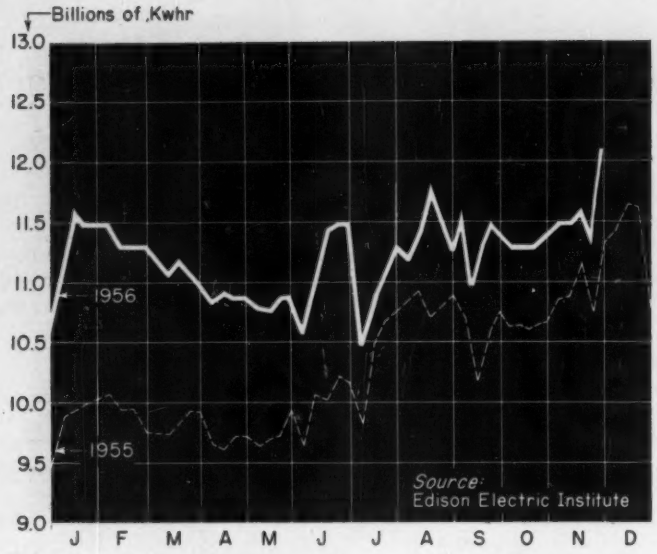
Searching and comprehensive self-study of the profession is not only a necessary and logical first step toward solution of these problems but an urgent one as well. Through such a study the two national joint councils are seeking answers to such fundamental questions as these:

- What are the strictly professional services and responsibilities of engineers; their role in society?
- What demands are engineering and the other professions making on the national supply of brain power?
- What is an engineer? Who is he? What are the origins and background of the individual engineers?
- What sub-professional services are allied to professional engineering?
- What is the contribution of the educational system to the development of the professional engineer?
- Should licensing be expanded? How?
- What are the major branches of engineering for meaningful organizational purposes?

In developing answers to these and related questions the survey will seek to determine the obligation of the engineering profession to society, the extent to which it is being fulfilled, and the steps necessary to enhance its efforts in the most effective way.

Only a top-to-bottom survey, such as the joint councils have conceived, can measure the tasks required of the engineering profession and assure the profession that it is training, attracting, utilizing, and rewarding men of the highest competence and potentialities.

ELECTRICAL WEEK



OUTPUT

Week ended Dec. 1, 12,075,000,000 Kwhr Up 6.3%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 6.6%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Dec. 1	+6.3	+5.9	+4.9	+4.9	+6.1	+7.0	+8.1	+7.4	+9.1	+8.1
Nov. 24	+6.6	+6.9	+4.7	+5.5	+8.7	+7.0	+11.8	+7.1	+5.2	+8.0
Nov. 17	+3.9	+3.6	+3.8	+3.6	+4.0	+5.7	+7.2	+3.7	−3.7	+4.6

Seasonally Adjusted Index 225.1 Week Ago (Revised) 221.9 Year Ago 211.7

Here are the issue's highlights . . . A look inside the FPC reveals little politics, high morale, and a brighter outlook for the future. Manpower is still a main concern . . . Soil fertility improves with electrification in Arizona experiments . . . Special report describes status of U. S. supercritical pressure plants . . . Record-breaking expectations revealed in large generating equipment field according to EEI's 20th semi-annual power equipment survey . . . Appliance sales promotions are paying off for Cincinnati G&E . . . Two new insulated tools let linemen apply compression splices on hot ACSR . . . Exit snow shovels with heating cables . . . Long range, four-step public relations program aims for preference clause extinction.

Because of low water conditions Bonneville Power Administration has suspended all deliveries (500,000 kw) of interruptible power to 13 industrial users in the Pacific Northwest. Cut does not affect firm power commitments.

Electric heating of all types will consume 4.2 billion kwhr in 1956 and 11.9 billion kwhr in 1960, NEMA representative tells some 180 utility and manufacturing executives attending ELECTRICAL WORLD's Electric Space Heating and Heat Pump Conference in New York.

Heaviest saturation of electric resistance heating in nation is in Las Vegas area, served by Southern Nevada Power, revealed EW at its recent Space Heating and Heat Pump meet. SNP, with 30,000 total meters, has 18,600 all electrically heated homes and commercial buildings for saturation of 60%. Low residential rate is 6 mills, average residential use, 9,600 kwhr annually.

Development of economic nuclear power will boost value of hydro plants for peaking capacity and raise desirability of pumped storage hydro projects, predict M. J. Shelton and Fred J. Groat of California Dept. of Water Resources.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . New York State Power Authority files for rehearing on FPC's rejection of a license application for $566-million Niagara hydro project. This is preliminary to court appeal . . . Kenneth L. Smith is new assistant chief of FPC's Bureau of Rates and Gas Certificates . . . Power Reactor Development Co petitions for exemption from Public Utility Holding Company Act . . . United Auto Workers and two other labor groups renew request for restricted data in order to prepare for safety hearing on PRDC reactor . . . Cumulative net electric loans approved by REA at end of 1955 totalled $3.1 billion.

New rules of practice and procedure for regulation of utilities in Mississippi will be put into effect on Jan. 1.

New England Electric System plans to merge five subsidiaries in northeastern Massachusetts into a single operating unit called Merrimack-Essex Electric Co. The merger is subject to approval of SEC, Mass. DPU, and shareholders.

Formation of Vermont Electric Power Co, Inc, has been authorized by Vermont PSC with the condition that it not be construed as an exclusive franchise for handling St. Lawrence power.

Savannah Electric & Power and IBEW sign two-year pact, effective until Nov. 15, 1958, with wage reopening after one year. Major provisions are 5% wage hike, additional holiday, and expanded vacation benefits.

Halsey, Stuart & Co group wins $10 million Dallas P&L first mtg. 4¼% bonds (Aaa) due 1986 at 100.09%; reoffers at 100.848% to yield 4.20% . . . Merrill Lynch, Pierce, Fenner & Beane is offering one million common shares Public Service E&G at $31.125 to yield 5.78% . . . Memphis, Tenn., will probably sell its $154 million electric light plant revenue bonds this week through a group headed by Salomon Bros. & Hutlzer.

Congratulations—Ohio Brass Co ups George L. Draffan to newly created post of chairman and chief executive officer. Roger A. Black succeeds Draffan as president and chief administrative officer.

ABOUT PEOPLE IN THE INDUSTRY

Memphis Light, Gas & Water "may be able to undersell TVA depending on what the government does with TVA." This hope was expressed by **Maj Thomas H. Allen,** LG&W president, who said some local firms are already expanding their facilities and inquiries are being received from outside industries because of the assurance of a future adequate supply of low-cost power from the city's proposed 750,000-kw plant.

A high Hells Canyon Dam bill will be introduced as one of his first acts in the new session of Congress, says **Sen Wayne Morse.** The Oregon Senator said he believes a number of Republican senators who voted against the measure last year would vote for it now. Morse urged that Congress study the merit of setting up a federally chartered Columbia River company to finance power projects by revenue bonds.

More News About People page 224

The FPC: An Inside Look

Chairman Kuykendall

Seaborn Digby

The Federal Power Commission today is up to its ears in natural gas work. But it's completely incorrect to conclude that hydroelectric development, and consequently FPC's work in this field, is on the way out.

These facts stand out in an examination of this 36-year-old Washington regulatory agency: business is booming in both hydro and gas.

Although FPC is busier than it was some three or four years ago, it is also in far better shape—in organization and manpower—to handle its job.

It has simplified many of its regulations, cut through some of its red tape to ease the work load, cut down on some relatively low priority jobs, and tried to make better use of available manpower.

Things have been measureably helped by the fact that an Eisenhower-appointed group, which seems to be pulling well together, is in the saddle at FPC. The agency's record of production—handling cases and not having them overturned by Congress or the courts—has been almost 100%. The outlook for the agency isn't all rosy, but it's certainly better than it's been in years.

While the bigger work load on gas has been widely publicized—including the effects on FPC of the Supreme Court's Phillips decision which put thousands of independent gas producers under FPC's jurisdiction—the fact has generally been overlooked that there has been a spectacular growth in recent years in non-federal hydro-electric development (see chart).

As FPC Chairman Jerome K. Kuykendall puts it, "The FPC is confronted with a workload which is not only tremendous, but also presents novel and perplexing problems as well."

Kuykendall gives this picture of the changes that have taken place within FPC from 1953 to 1956: a 667% increase in the number of certificates of public convenience and necessity; a 549% increase in number of gas rate filings; an increase from 1,324 in 1953 to 4,060 in 1956 in notices, orders, decisions, and opinions issued, and a jump from 78,000 in 1953 to 809,000 in 1956 in the number of those documents distributed.

How is FPC coping with its present situation? For the one thing, it has been and is in the process of being reorganized.

The Shakeup

When President Eisenhower in 1953 tagged Kuykendall, then chairman of the Washington State Public Service Commission, to be chairman of FPC, that agency was just about ripe for a shakeup.

Thomas C. Buchanan, who preceded Kuykendall as chairman, complained on his retirement that year: "Dwindling appropriations since 1950 and a rapidly mounting case load" had made FPC's task almost insur-

Frederick Stueck

Arthur Kline

William Connole

at Its Progress, Problems, and Future

mountable. He could also have pointed to dwindling manpower. Total staff fell to 631 that year from a previous high of 744 in 1951.

Morale Sinks

More important, though, FPC morale was at a record low. Commissioners were pulling in all directions. The agency itself had just escaped former Interior Secretary Oscar Chapman's abortive attempt to make it a rubber-stamping function of Interior. And the electric industry still wasn't sure Leland Olds' public power philosophy had left with him.

In 1954 FPC began its reorganization. The Hoover Commission had pinpointed some Washington agency weaknesses. FPC had also called in an outside management consulting firm to study its problems.

The first step was to appoint an executive director empowered to take over from the chairman the executive and administrative functions. The man chosen was Henry R. Domers. As a General Accounting Office employee since 1935, he had been director of the European branch and had also served as U. S. representative on the international board of auditors for North Atlantic Treaty Organization.

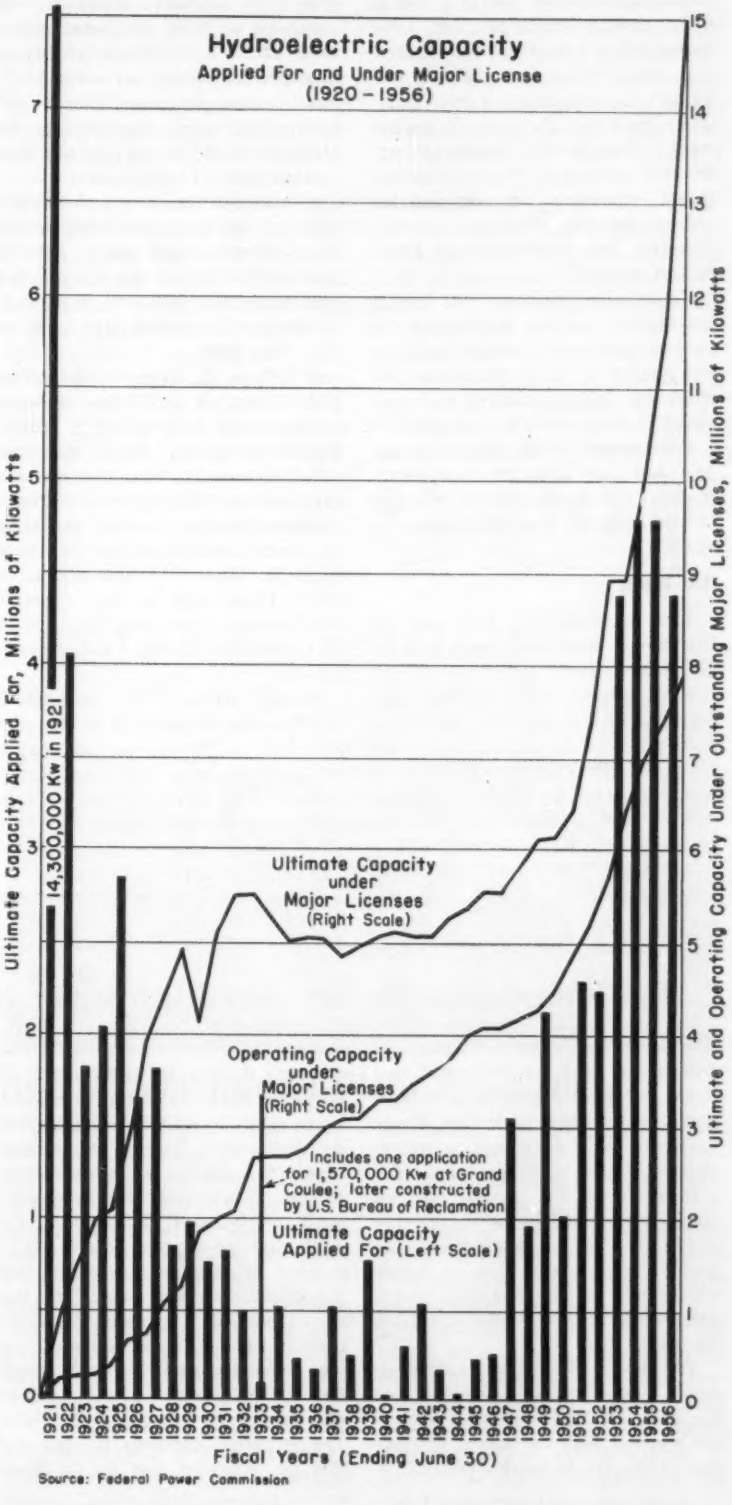
Domers describes the FPC's reorganization more as a realignment of functions and a removal of divisional lines than as a complete shakeup. The net effect is that FPC can, with divisional lines out of the way, swing its existing manpower wherever it is most needed. Divisional lines, FPC said, emphasized specialization and tended to impede effective use of personnel.

Important also from the industry point of view, was the split up of the top-heavy Bureau of Accounts, Finance, and Regulation which had come to be regarded by industry as the most dictatoral of FPC's divisions. This became the office of the Chief Accountant and the Bureau of Rates and Gas Certificates.

Manpower Shortage

Mere reorganization though has not solved FPC's problems. In common with other government agencies, it hasn't found the answer yet to its manpower problem.

Last October's employment figures show 720 FPC employees—far short


Hydroelectric Capacity
Applied For and Under Major License
(1920 – 1956)
Ultimate Capacity Applied For, Millions of Kilowatts
Ultimate and Operating Capacity Under Outstanding Major Licenses, Millions of Kilowatts
14,300,000 Kw in 1921
Ultimate Capacity under Major Licenses (Right Scale)
Operating Capacity under Major Licenses (Right Scale)
Includes one application for 1,570,000 Kw at Grand Coulee; later constructed by U.S. Bureau of Reclamation
Ultimate Capacity Applied For (Left Scale)
Fiscal Years (Ending June 30)
Source: Federal Power Commission

of its needs. Eighteen months previously employment was at a low of 612. Asking Congress for more money doesn't help, for as Kuykendall says, "Very few qualified personnel are available at the salary scales paid by the federal government." This is true despite the pay increase authorized by Congress for federal employees this year and improved pension benefits. Actually, Congress has been granting FPC's budget requests.

To solve its problem, FPC has, in Kuykendall's words, endeavored "to perform more work, without reducing the quality of it, by increasing our efficiency. We are meeting with considerable success in this endeavor."

Poke around in the commission today and you hear few staff complaints. Old timers there tell you morale is better than it has been for years.

The Team

The commissioners too, now all Eisenhower appointees, work well together as a team.

Kuykendall's term expires next June. The few potshots that have been taken at him—such as on the timing of FPC's Hells Canyon ruling—have not built up into major attacks. Associates believe he would consider reappointment if it is offered.

The team, in addition to Kuykendall, consists of:

• Seaborn L. Digby, described by some as an Eisenhower Democrat, was appointed in 1953. His term expires June 1958. A Louisiana lawyer, he was district attorney and subsequently judge for the parishes of Lincoln and Union, and, later, city attorney for Monroe. Most recently, he was state commissioner of conservation.

• Frederick Stueck, a St. Louis Republican, was practicing law privately when he was nominated to FPC in June 1954. Before the war he had been chairman of the Missouri Public Service Commission. His term expires June 1959.

• William R. Connole of Naugatuck, Conn., is at 33 the youngest member ever to serve on a federal regulatory agency. He is described politically as an Independent, and associates say this applies to his nonpolitical thinking as well, including his commissioner functions. His term began in June 1955 and expires in 1960. From 1950 to 1955, Connole was counsel to and chief legal officer of Connecticut Public Utilities Commission.

• Judge Arthur Kline, Republican of Cheyenne, Wyo., is the most recent appointee to FPC having taken office in June. He was assistant attorney general of Wyoming from 1939 to 1942, and was deputy secretary of state of Wyoming for part of 1943. In 1953 he was appointed judge of the first judicial district of Wyoming, and was elected to a six-year term in 1954.

Outside opinion of the commission, certainly among the electric companies, is highly favorable.

Company lawyers who have to conduct business with the commission have great respect for the thoroughness and competence with which the staff goes into various problems. This is true not only of the legal department (and company lawyers have nothing but praise for FPC lawyers), but also of the engineering, financial, and other staffs.

Says one electric company lawyer who has been beating a steady path to FPC's doors for years: "The present commission does about as thorough a job of protecting the public interest as anyone could wish. I have been particularly impressed with their hearing examiners who bend over backwards to give everyone a chance. And there is less politics in FPC today than in any Washington agency I have dealt with."

Courts Uphold FPC

FPC has an excellent record of being upheld by the courts for its decisions.

Some of these court cases, notably the Hope natural gas case have become landmarks in the regulation of electric and gas rates. Hope firmly established the use of the prudent investment formula over fair value as the basis for setting rates.

Commission Rules "No Authority" on Niagara Issue

The Federal Power Commission decided last week, as anticipated, that it did not have authority to issue a license to the New York State Power Authority for a $566 million hydroelectric project at Niagara Falls.

In so doing, FPC said it was not empowered to determine the validity of the 1950 Senate treaty reservation giving Congress the right to decide who should develop Niagara's power potential on the United States' side of the Falls.

The issue of Niagara redevelopment, unresolved by Congress for the past six years, gained urgency last summer with the partial destruction of Niagara Mohawk's Power Co's Schoellkopf plant by a rock slide. The company then agreed to turn over to the power authority part of its licensed water rights if the FPC would grant the Authority a license. But as one of the five electric utility companies seeking to undertake the redevelopment of Niagara, it opposed the Authority's application before FPC.

Also as a consequence of the Schoellkopf disaster, the FPC last week received a petition from 42 industrial plants in the Niagara Falls area demanding that Niagara Mohawk continue to generate 25-cycle power when service is resumed at the Falls. The industrial concerns pointed out that no provision has so far been made for such generation and that present plans by the company and the Authority indicate neither would switch to 60-cycle current. Conversion of industrial facilities to 60-cycle current, the industrial companies asserted, "would impose an insupportable burden of many millions of dollars."

In its decision on the Power Authority application, FPC made it clear that as an arm of Congress, "We cannot determine the constitutionality of an Act of Congress." The finding was unanimous with Commissioners Seaborn L. Digby and Frederick Steuck filing separate but concurring opinions.

he would consider reappointment if it is offered . . ."

Outside of the regulatory field, unquestionably the most significant court decisions have been the Roanoke Rapids and Hells Canyon cases. The net effect of these decisions has been to strengthen the discretion granted FPC by Congress under section 7 (B) of the Federal Power Act. This discretion permits FPC to deny an application for license for any non-federal water resource project if it thinks the project should be undertaken by the federal government instead.

The commission, of course, has its detractors. Mostly these are public power Congressmen who have attempted to circumscribe FPC by legislation. They have not had notable success.

FPC itself would like some areas of its responsibilities clarified by legislation. This is particularly true of its rate regulating responsibilities over certain federal projects. The commission does not pass on all federal project rates but under the Flood Control Act of 1944 it must approve and confirm rates for some projects, including those of the Southwestern and Southeastern Power Administrations.

Former Chairman Buchanan first complained to Congress of this situation in 1952. What had been happening, notably in SWPA, was that Interior had set the rates, more on a political basis than an economic one, and FPC had to go along.

Buchanan told Congress, and Kuykendall today voices the same feeling, that if it is the desire of Congress to subsidize such rates, "the subsidy should be both direct and readily identifiable," and this should be made perfectly clear in enabling legislation.

Buchanan recommended that Congress lay down definite standards of cost allocation and amortization for federal power projects, and that FPC either be given complete rate-making authority for such projects or be relieved of all responsibility for rates. This situation still hasn't been resolved.

There is no sign of the commission's hydroelectric work tapering off. According to FPC figures, less than 25% of the country's potential hydro power has been developed although much of what remains is not economically feasible at present.

Chairman Kuykendall believes that aside from the problems associated with the regulation of the independent gas producers, his major concern is manpower. "We are faced with an aging staff although we are trying to correct this defect," he says.

Plant Walkout Ends for Commonwealth Ed

Workers at Commonwealth Edison Co's State Line Station returned to their jobs at midnight Friday, Nov. 30, following a walkout that had lasted just two hours short of seven days.

Settlement of the labor dispute was based on an offer made previous to the walkout and which is in line with the contract settlement accepted by other organized groups in the company earlier in the year. The State Line Station workers are organized by district 50 of the United Mine Workers. Other company workers are organized by International Brotherhood of Electrical Workers.

Company spokesmen were not able to explain the immediate cause of the walkout, although the contract with UMW workers had expired in the spring. The IBEW group had accepted a contract in August which provided wage increases dating back to April 1.

The recent walkout was ended after two meetings between union and company negotiators, held under auspices of the U. S. Mediation Service.

Supervisory employees manned the utility's plant during the seven-day walkout.

Spain Launches 12-Plant Program

The first 70,000-kw thermal generating unit will begin operation this week at Spain's Escombreras station (above), which on completion will be Spain's largest thermal power station and the largest American engineered plant of its kind in Europe. Located at Cartagena on the Mediterranean coast, the $40-million plant next year will add the final two units—rated respectively at 70,000-kw and 140,000-kw.

Completion of Escombreras' first unit ushers into production Spain's $120-million, American engineered thermal power plant expansion program which includes 12 such stations in as many Spanish cities. Nine of the plants are slated for 1957 operation, the remaining three in 1959. Combined capacity of the 12 plants is 872,500 kw, which will add 4.3-billion kwhr annually to the nation's electric power output.

Of the 627,500 kw planned for 1957's nine plants, turbo-generators representing 470,000-kw will be supplied by General Electric Co and Westinghouse Electric Corp. Steam generators for all nine plants are of Babcock & Wilcox Co and Combustion Engineering Co manufacture.

Electrified Soil

Electricity can help reclaim bogged and salted farmland quickly, producing dramatic results with crops. Experiments conducted by Collopy Electro-Soil Co, Phoenix, Ariz., with help of Salt River Power District, produced a crop of cardinal grapes four to six times larger than crops grown on the land before the experiment.

Anode pipes of 2-in. scrap steel are driven into the ground on one side of a field. On the other side, cathodes of 1-in. steel are driven into the earth. These electrodes are connected to a dry-plate selenium rectifier which converts 220v to 65v dc at 7 to 16 amp.

Posing no danger to field hands, this rig drives salt solutions deeper into the ground, making the top-soil more fertile, the SRPD reports. Power District engineers said that during a 10-month period of constant testing on one ranch, 5,462 kwhr were used, costing about $156. Only 1,900 kwhr were needed to increase the size and improve the crop of honeydew melons at another ranch. Cost of electricity per acre has averaged between $2.40 and $10 for the experiments.

Treated earth becomes more porous and absorbs more irrigation water in a shorter time. Previously, irrigation water was washed over the land, a drawn-out process of small return.

From Skin-of-Teeth Dep't . . .

Seattle Department of Lighting was scheduled to install the fourth 90-Mw generator at its Ross powerhouse in July. But the Westinghouse strike shifted the delivery date to Dec. 21. Meanwhile, load was climbing.

The manufacturer beat the promised delivery date by more than a month, however, and the unit went on the line Nov. 19—just in time to meet a record peak of 745,000 kw that evening. The Ross station now has a 360-Mw capacity.

N. Y. Cops Hunt Con Ed Hater

New York's police are searching for a man, believed in his 50's, who has terrorized the city for 16 years by planting homemade bombs in public places, and who is an avowed hater of the Consolidated Edison Co of N. Y., Inc. His latest blast in a Brooklyn theater hurt at least four persons.

In a note to a New York newspaper last March, just released by police, he claimed he has planted 52 bombs in his elusive 16-year career. Police already have written off 27 blasts to the terrorist. He wrote in the letter that any business dealing with Con Ed would be considered a legitimate "target." He said he wanted to prove to the public he could be "just as rotten and mean as the corporations or the yellow press."

Police know little about this man and are pulling out all the stops to catch him. Police Commissioner Stephen P. Kennedy has promised an "immediate good promotion" to any member of the force who arrests the guilty person.

Atomic Coal Gasification

Nuclear power some day may be used to gasify coal underground in a process which may eliminate the oxygen plant now used in gasification experiments. The Bureau of Mines and Atomic Energy Commission are seeking a possible substitution of nuclear heat for gas heat now used in experiments. The experiments are being conducted to find substitute gases for natural gas, which is growing more costly and scarce. Gasifying coal underground with steam and nuclear heat would yield a better economic use of coal's energy, for none would be wasted through burning.

Co-op Resolutions

Resolutions adopted at the recent Region IX meeting of the National Rural Electric Cooperative Assn. in Spokane, Wash., included:

- That authorization be requested for storage dams at Nez Perce, Hells Canyon, Paradise, Glacier View, and Bruces Eddy sites.
- That Congress be asked to rescind an FPC license to Idaho Power Co for three low dams on the Snake River.
- That recommendation be made for conversion of Bonneville Power Administration into a public corporation, "and that its service area include all of Montana, Idaho, Oregon, and Washington, and that this proposed 'Columbia River Development Corporation' be permitted to issue electric revenue bonds. . . ."
- That, at the next meeting, the membership consider collecting a "national war chest for national emergency education and legislative battles, to be raised by voluntary contributions, to carry on such fights as Hells Canyon and Niagara."

Rep Walt Horan (R-Wash.) told delegates that water should be stored for the sake of storage, and that, if necessary, he would introduce a bill in Congress giving the Corps of Engineers and interstate agencies "a clear mandate" to store water for future power increases and better flood control.

It Massages Gums, Too

Proral Corp of Springfield, Ill., is marketing a new 8.5-w electric toothbrush that can run under water. One motor unit can serve the whole family. Brush heads are interchangeable and come in eight "decorator approved" colors, including "dusty pink."

Fly Ash Specifications Listed in BCR Booklet

"Fly Ash for Use as a Construction Material" has been published by Bituminous Coal Research, Inc. Carrying specifications, it is designed to serve as a reference handbook for architects, consulting engineers, contractors, and builders.

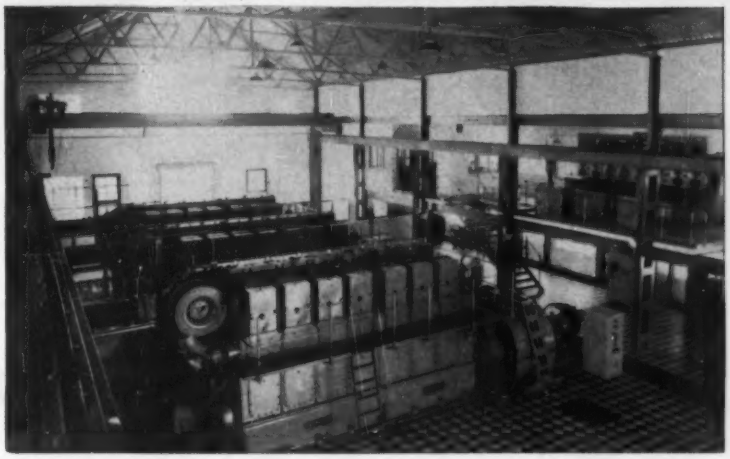
The 24-page, illustrated booklet covers the economic and engineering value of using fly ash. It lists established uses for the waste product, and pictures projects which have used fly ash to advantage.

Included are the chemical and physical specifications for fly ash as written by American Society for Testing Materials, Intrusion Prepakt, Inc, the Bureau of Reclamation, Boston Army Base Corps of Engineers, New York State, and the cities of Detroit, Chicago, Philadelphia, and New York.

More than 200 fly-ash sources are listed by state and city, with "contact man" named, and data on yearly production, the method of disposal (wet or dry), and handling facilities (bag or bulk) at each plant. Sources include private utilities, municipal power companies, industrial companies, and fly ash brokers who sell this material on a contract basis.

Hungry Horse Dam, the booklet points out, is the largest single installation using fly ash. This 285-Mw hydroplant contains 126,000 tons of fly ash. Savings amounted to $1.5 million.

The booklet may be obtained at $1 a copy from BCR, 121 Meyran Ave., Pittsburgh 13, Pa. (For background details on the utility's place in the fly ash market, see "Fly Ash Demand May Top Supply," EW, Aug. 27, p 16.)



Power Plant Takes on Tropical Flavor

The exotic splendor of the tropics has been captured in the design of this recently completed power plant in Zanzibar, British protectorate off the east coast of Africa. The station, planned according to the wishes of the country's sultan, was built by the British to give the island its first ac electricity. It is part of a ten year plan to aid the country, toward which Britain is contributing about $3½ million. Lower photo shows the more conventionally designed interior of the plant.

NEWS IN BRIEF

STEAM

Cincinnati Gas & Electric will add a 172,000-kw, $28-million unit to its Miami Fort station which, upon completion in late 1959, will lift company's total capacity to 1,250,000 kw . . . Addition of a 150,000 unit to its Portsmouth station is planned by **Virginia Electric & Power Co.** The unit is expected to go into operation during 1959.

Pulverized lignite, from North Dakota mines, will generate steam at **Otter Tail Power Co's** projected 53,500-kw addition to its Hoot Lake station . . . First unit, with capacity of 225,000-kw, is now in operation at **Tennessee Valley Authority's** New Gallatin plant.

Duke Power is planning construction of a third unit at Allen plant as part of its recently announced $40-million expansion program. Allen No. 3, slated for 1959 service, will be rated at 275,000 kw and will cost over $30 million. Also planned is addition of about 125 mi to Duke's 230,000-v transmission system.

Carolina Power & Light Co's new 180,000-hp unit at Moncure is slated to begin operation this month. Meanwhile, construction has started on an

(*Continued on page* 231)

It's Standing Room Only as . . .

Cincinnati Sparklers Pay Off

Year-'round sales promotions, contests, demonstrations keep saturation totals and dealer sales climbing. Tie-ins with newspapers, allies, and others help pull up to 52,000 contest entries

Ever run a "Dishwashing Derby," collected coupons in a "Piggy Bank" contest, or promoted cooling equipment with a theme "In the Good Ol' Summertime—B. E.*?"

These and other Cincinnati Gas & Electric Co concoctions are pleasing a lot of palates. Since 1952 the company has boosted dealer sales and saturation percentages by whetting the public's appetite with this year-'round promotion recipe: Integrity, showmanship, lots of prizes.

Does it pay? "Draw your own conclusions," says Edward W. Hodgetts, director of promotion, advertising, and publicity. He cited the sales of 707 Greater Cincinnati dealers (see box).

And how did it all begin? Says Hodgetts: "Our approach to promotion was inspired by the editorial 'Put Sparkle in Promotion' which appeared in Electrical World Jan. 28, 1952. It asked: 'Why does the electrical industry labor under the delusion that it is degrading to use all the techniques of modern promotion?' "

CG&E feels it is definitely not degrading. "We have to use methods of the automobile, jewelry, furniture, travel, and amusement industries to get people to spend their money with us," according to Hodgetts. "Contests, appearances of celebrities, and timely exhibits encourage newpaper editorial support and conversation."

The promotions follow this pattern: One of three daily papers ties in and profits from special sections, which usually announce the event. Product people ranging from cosmetics and bottled drinks to foodstuffs and sports equipment cash in on the publicity by adding to the contest booty. Local distributors supply demonstration and display models. CG&E gains added mileage by timing its programs with national promotions and providing dealers with window displays and material.

The Dishwashing Derby is a case in point. The month-long promotion, sans horses, pitted speed and convenience of an automatic dishwasher against housewives who washed by hand. During a one-week contest over 600 ladies received $5.25 (retail) sets of cosmetics. Three daily winners got dinnerware sets.

To wrap it up, daily winners competed for the champ's title. The swiftest lady won a $500 portable dishwasher-disposer and a year's supply of detergent. Earlier, the Derby took on a daily-double aura as the

* Before Electricity

cosmetic representative staged before-and-after makeup demonstrations in a street window. The results: CG&E estimates 1956 dishwasher sales will be 30% higher than 1955's.

Biggest contest splurge to date resulted from the Piggy Bank idea. The one-month freezer and refrigerator push brought in 52,463 entries in a 15-day period. Here's how it worked:

Coupons clipped from the paper were exchanged for Live Better . . . Electrically coins. Contestants who got a gold coin won 15-lb hams. With red coins visitors chose one of four piggy banks for deposit. If the ersatz porker squealed as the coin dropped owners got ½-lb bacon. Those with silver coins kept them as reminders to buy a freezer or refrigerator Piggy Bank.

Drew 16,000 Entries

For the finals coupons were drawn for 300 4-lb picnic hams. Grand prize was one $400 freezer or refrigerator plus a 150-lb dressed and packaged pig.

To boost fan and air conditioner sales and promote dehumidifiers and heat pumps, CG&E staged a one-month program. In the Good Ol' Summertime—B. E. showed how people kept cool in the past and compared antique methods with today's electrical devices.

It included a Beat the Heat contest which drew 16,000 entries. Coupon bearers tried to raise the "mercury" in soda pop bottles up to "hot" for a free six-bottle carton. If they reached "warm" a king-sized bottle was won and "cool" readings brought the 6-oz size. Two daily winners got ball game tickets. Grand prizes were $400 and $350 room air conditioners, $150 dehumidifier, and $100 attic or window fan.

Want Everybody in Act

What's the scope of CG&E's promotional work? "We try to plan our exhibits at Fourth & Main so that they provide the central theme; a locale for VIP's and shows," says Hodgetts. "We want as many people as possible to get in the act. We want people to discuss what we're doing while they are riding the busses, while they are at dinner tables, and while they are at work and play."

Judging from the contest response, trade ally participation, and sales results, the concoctions more than meet these aims.

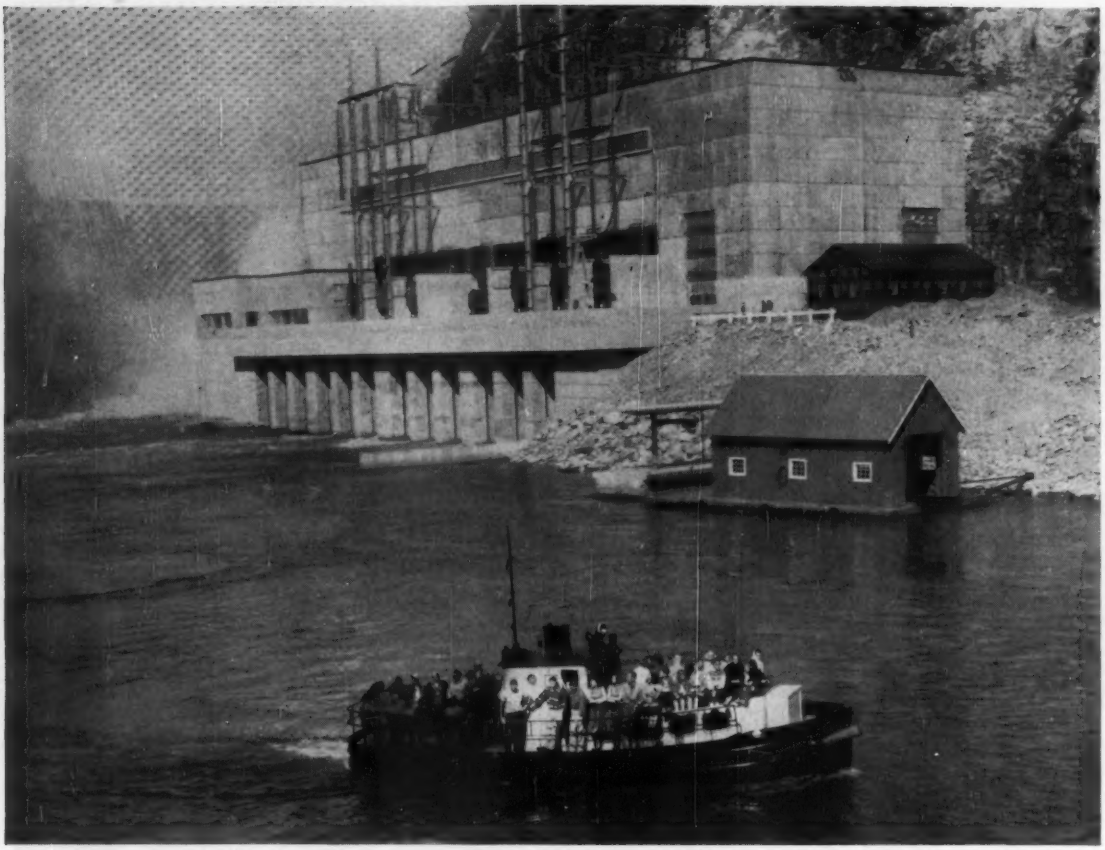
"BEAT THE HEAT" CONTEST shows how easy it is to keep cool with electric equipment, soda pop. Almost 16,000 brought coupons in for awards worth $1,000

CHAMPION DISHWASHER COMPETES with electric unit in promotion that has helped boost this year's automatic dishwasher sales of dealers by about 30%

These Sales Figures Show Promotion Pays

	Greater Cincinnati Units				National Units*		
	1954	1955	% Increase	1956 Estimate	1954	1955	% Increase
A.C. (room coolers)	9,254	14,481	56.5	17,000	1,230,000	1,290,000	4.9
Bed coverings	3,274	6,040	84.5	.....	1,050,000	1,350,000	28.6
Dishwashers	2,080	2,325	11.8	3,300	215,000	295,000	37.2
Disposers	3,994	5,600	40.2	6,400	400,000	520,000	30.0
Dryers	6,135	7,673	25.1	9,200	697,000	1,085,000	55.6
Washers, auto.	16,747	25,140	50.1	28,000	2,401,000	3,187,000	32.7
Washers, conv.	17,584	19,792	12.6	22,000	1,209,000	1,200,000	— 0.7
Water heaters	4,790	5,492	14.7	6,200	800,000	900,000	12.5

*Electrical Merchandising, January, 1956



Skagit Hydro: Spicing for the Tourist

Seattle Department of Lighting's Skagit River hydro project has become a prime Pacific Northwest tourist attraction. A 4½-mile boat trip, a 600-ft ride up an incline railway, and hearty construction crew meals add spice to the area's rugged attractions.

The tour got its start in 1928 when intrepid members of a Seattle women's club embarked on the 130-mile drive northwest to Newhalem. Their power plant inspection exposed them to jagged peaks, abrupt ridges, deeply etched canyons, and snow-cold waterfalls. As word got around about the overnight jaunt, City Light set up guided tours. By 1941, as many as 1,800 persons a week made the trip in parties of 600.

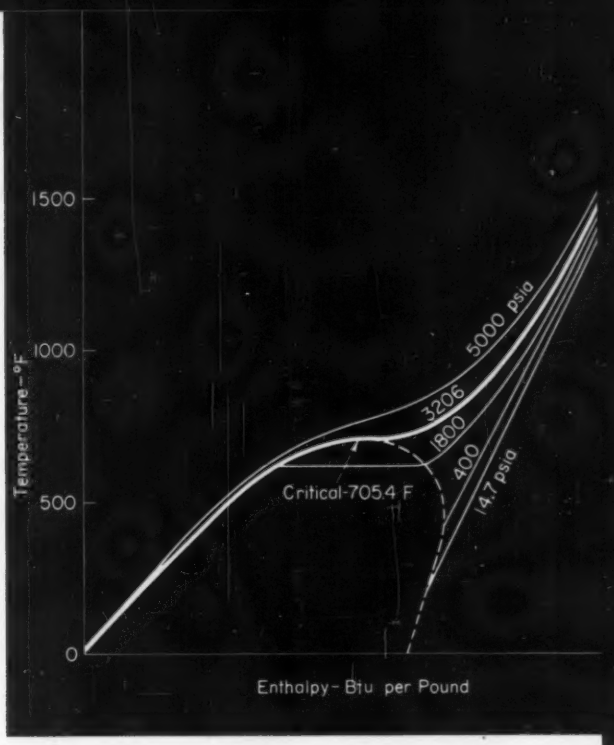
Except for war and construction years, totals have continued to grow. Last summer 3,555 visitors took the excursion.

In recent years the tour has become a one-day affair. It includes a visit to Gorge powerhouse, railway ascent to Diablo Lake and dam, and boat ride to Ross plant and dam.

City Light charges $3 a head to cover direct expenses. The number of "thank you" notes and the length of next year's waiting list indicate the tours are scoring well public relations-wise.

A Special Report

Utilities Pick Supercritical Steam for 1.9 Million Kw



JOHN J. KEARNEY,

Asst Managing Technical Editor

Power plants employing supercritical pressure steam cycles are no longer academic topics for professional society papers. They are realities. Electrical World's special report shows that the utility industry has made commitments for six supercritical pressure plants with a capacity of almost 2,000 Mw.

One of these plants, Philo No. 6 (Ohio Power Co) may go on the line later this month. Other units are in various phases of development, from the drawing board to actual construction.

This report concentrates on the second supercritical plant announced for installation in this country—Eddystone unit No. 1. It has the most advanced steam conditions of all the supercritical-pressure units so far contemplated. Material has already been published on two of the other plants, Philo No. 6 (EW June 29, 1953 p 72, Sept. 6, 1954 p 82, Apr. 16, 1956, p 92, May 7, 1956 p 48) and Avon (EW July 2, 1956 p 18).

The outstanding features of Eddystone, the important design and equipment innovations, and the reasons for them are presented in four articles which discuss the station design, steam generator, turbine generator, and station auxiliary power system.

The status and important design details of all the supercritical pressure plants are presented in chart form for easy reading.

Some questions on supercritical-pressure operation—which undoubtedly many in the industry are asking—are answered in the final pages of the report.

This Special Report Presents . . .

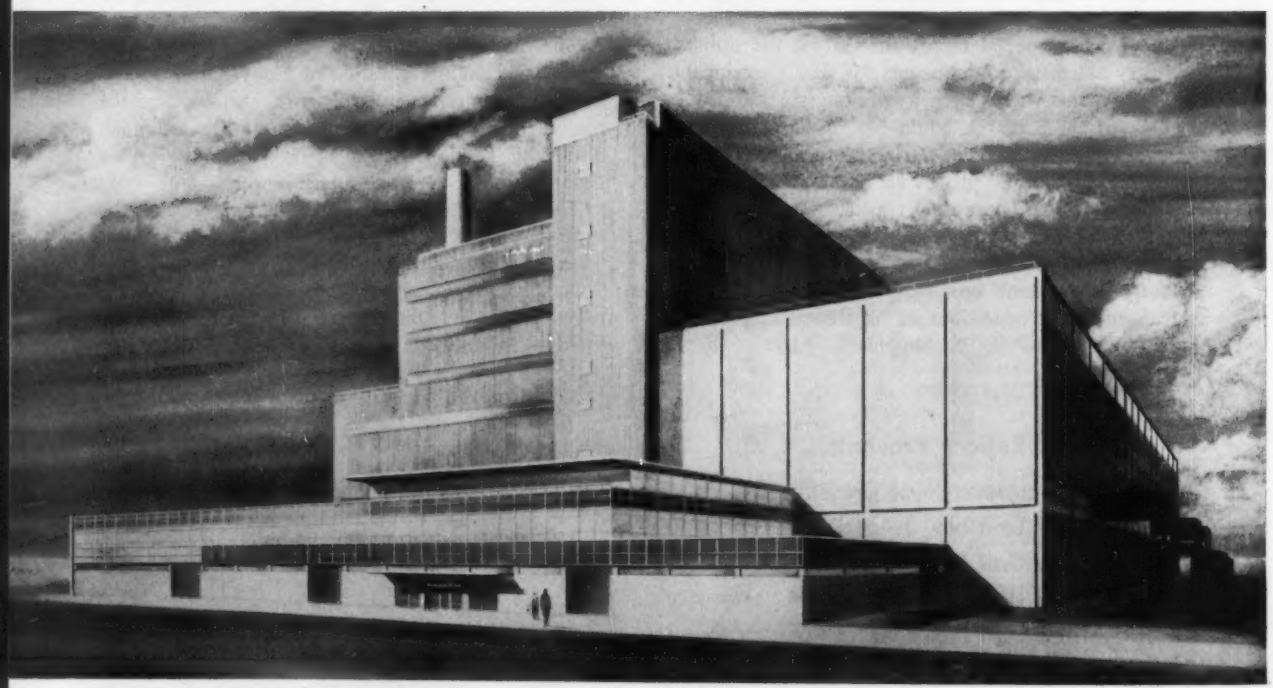
1. Status of supercritical pressure plants in the United States . . . . . page 104
2. Eddystone Unit No. 1—plant design . . . . . page 104
3. Eddystone Unit No. 1—steam generator . . . . . page 111
4. Eddystone Unit No. 1—turbine generator . . . . . page 114
5. Eddystone Unit No. 1—auxiliary power system . . . . . page 118
6. Pertinent questions and answers on supercritical pressure operation . . . . . page 120

Status of Supercritical Pressure

Unit	Philo No. 6	Eddystone No. 1
Operating Co	Ohio Power Co	Philadelphia Electric Co
Scheduled operating date	Dec. 1956	1959
Capacity, Mw	125	325
Steam pressure, psi	4,500	5,000 1,150 (initial)
Steam temperature, deg F	1,150	1,200 (ultimate)
1st Reheat temperature, deg F	1,050	1,050
2nd Reheat temperature, deg F	1,000	1,050
Steam flow, lb per hr	675,000	2,000,000
Expected net heat rate, Btu per kwhr	8,530	8,016[2]
Turbine-generator manufacturer	General Electric Co	Westinghouse Electric Corp
Steam generator manufacturer	Babcock & Wilcox Co	Combustion Engineering Co
Furnace arrangement	Single	Twin
Boiler feed pump manufacturer	De Laval	Ingersoll-Rand
Boiler feed pump drive	Motor	Motors & turbine
Boiler feed pump arrangement[3]	LP Pump/Htrs/HP Pump	LP Pump/HP Htrs/IP Pump/HP Pump
High temperature piping material	Type 347	Type 316
No. of heaters	7	9 (parallel lines)
Turbine-generator arrangement	Tandem-compound	Cross-compound 3,600 & 1,800-rpm shafts
Thermal efficiency, %	———	42.5[2]

Notes

1. Capacity based on gross generation less power or steam equivalent for feed pump drive.
2. At steam flow shown and 1-in. back pressure.
3. With one motor-driven BF pump and one turbine-driven pump. Heat rate is 8,360 Btu per kwhr with two turbine-driven pumps.



Plants in the United States

Eddystone No. 2	Avon No. 8	Breed	Philip Sporn
Philadelphia Electric Co	Cleveland Electric Illuminating Co	Indiana & Michigan Electric Co	Ohio Power Co and Appalachian Elec Power Co
early 1960	early 1959	late 1958	late 1959
325	250[1]	450	450
3,500	3,500	3,500	3,500
1,050	1,100	1,050	1,050
1,050	1,050	1,050	1,050
1,050		1,050	1,050
2,178,000	1,715,000	2,900,000	2,900,000
8,250[2]	8,603[3]	8,450[4]	8,450[4]
General Electric Co	Westinghouse Electric Corp	General Electric Co	General Electric Co
Combustion Engineering Co	Combustion Engineering Co	Babcock & Wilcox Co	Babcock & Wilcox Co
Twin	Twin	Single	Single
Ingersoll-Rand	Worthington		
Motors & turbine	Turbine[5]	Turbine[5]	Turbine[5]
LP Pump/HP Htrs/ IP Pump/HP Pump	Pump/Pump/HP Htrs	Pump/HP Htrs	Pump/HP Htrs
8 (parallel lines)	Type 316	Type P22	Type P22
Cross-compound, two 3,600-rpm shafts	8 Tandem-compound	9 Cross-compound, two 3,600-rpm shafts	9 Cross-compound, two 3,600-rpm shafts
41[2]	40	40.5	40.5

4. Based on preliminary design.
5. Also motor-driven pump for startup and emergency backup.
6. Location of pump in cycle in relation to high and low pressure heaters.

In Eddystone Supercritical Pressure Unit Due for Operation in 1959 . . .

Steam Conditions Will Hit New High

With steam at 5,000 psi, 1,200F, and double reheat to 1,050F, plant's heat rate will be about 8,016 Btu/kwhr

J. H. HARLOW, Chief Mechanical Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Eddystone No. 1, second supercritical pressure unit announced in this country, will utilize steam at the highest pressure and temperature yet considered. The steam conditions are 5,000 psi, with a temperature of 1,150F initially (1,200F ultimately) at the turbine throttle. It will have double reheat, both at 1,050F. Output of the unit is 325 Mw. And its calculated heat rate at normal rating of load and steam conditions, and 1 in. Hg back pressure is 8,016 Btu per net kwhr.

Steam will be supplied by a 2,000,000 lb per hr, once-through type steam generator. The turbine-generator will be a cross compound unit with a 3,600-rpm shaft supplying 46% of the load at full load and an 1,800-rpm shaft supplying 54%. Both steam turbine and motor-driven boiler feed pumps will be used.

In selecting the size, steam conditions, and heat cycle for this unit the criterion was to take maximum advantage of the most recent technological advances insofar as they could be reasonably supported economically. These very advanced steam conditions require large capacity turbines if full advantage is to be realized. Otherwise the highest pressure blading is so small that bypassing is a significant quantity. This factor indicated a desirable minimum size in the order of 250 to 300 Mw.

An analysis of improvements in efficiency obtained by increasing steam pressure, even at a temperature of 1,200F, indicates that there is little to be gained by exceeding 5,000 psi. Thus this pressure was chosen. Materials in normal use at this time were limited to about 1,150F in power plant service. But engineers were of the opinion that materials available would

Adapted from a paper presented by the author at the annual meeting of the American Society of Mechanical Engineers held at New York, N. Y., Nov. 26-30.

permit a 1,200F design in the critical highly stressed zones of the superheater and turbine rotor and that there was a Code material which could be used for piping.

Considering efficiency, effect of pressure drop, cost of pipe, etc. the best reheat pressure appeared to be from 20-25% of the throttle pressure. The first reheat was selected at about 1,150 psi and the second at about 275 psi. Reheat temperature was set at 1,050F, the practical limit for ferritic steels, the very large reheat piping being too costly when made of austenitic material. Further, engineers felt that 1,050F was about as high a temperature as should be considered in the highly stressed large rotating spindles at the reheat return points.

Cross Compound More Efficient

Although it was originally planned to use a 3,600-rpm tandem compound machine, studies indicated that substantially better performance (about 200 Btu per kwhr) could be obtained with a cross compound unit having an 1,800-rpm, low-pressure turbine with long blades and greatly increased exhaust area. This also permitted an increase in unit size from 275 Mw, as originally planned, to 325 Mw.

In designing the feedwater heating cycle it was recognized that:

1. A separate deaerating type heater should be provided because of the extreme importance of obtaining oxygen-free feedwater.

2. Two rows of feedwater heaters in parallel would be provided because of the large quantity of feedwater to be handled. With one row operative, the plant could maintain two-thirds capacity. Thus many valves and much piping and complication of controls could be eliminated.

3. Boiler feed pumps would be in pairs, arranged to comprise two rows with the feedwater heaters. A spare rotor would be provided for each pump, although a spare pump and drive would not be installed.

With the exception of the deaerator, feedwater heaters are the closed type. High-pressure heaters have integral drain coolers, and those receiving high-temperature steam have desuperheating zones to obtain the maximum rise of feedwater temperature. All heaters are arranged horizontally.

The deaerators, one in each row of heaters, are at the 55-psia bleed point with an additional connection to the second cold reheat line to provide a floor of 3 psig at flows below 30%. Each deaerator is a single unit of the tray type. Each is equipped with a storage tank of 3-min capacity. They are 100 ft above the pump suction.

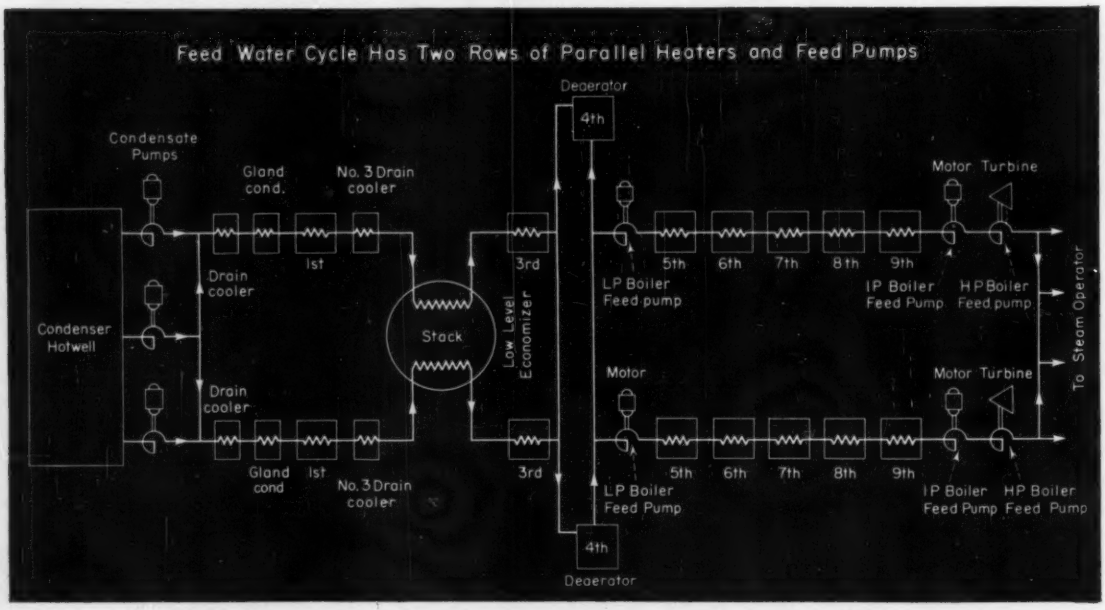
The low-pressure portion of the heat cycle has two interesting features. One is the use of bleed steam to protect the cold-end of the preheater; the other is the utilization of a low-level economizer.

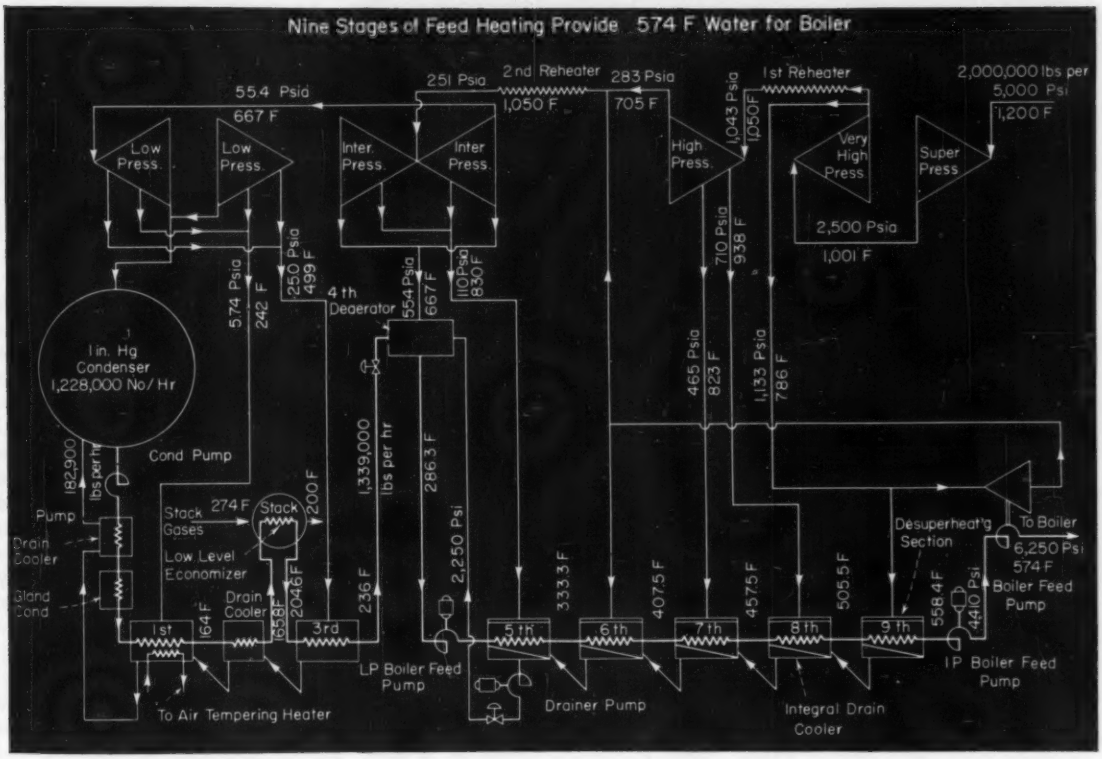
Preheaters Cool Stack Gas

Large air preheaters will cool the stack gases to 250-275F. To protect the cold-end of the preheater during periods of low outdoor temperatures, incoming air is preheated to 100 or 125F. Steam for this must be at a higher pressure than the air at all loads to prevent leakage of air into the steam in the event of coil failure. A separate closed-circuit heat transfer loop, with its own circulating pump, is used for this purpose. Steam from the first bleed extraction point at about 6 psia provides the heat source. For simplicity in handling the bleed steam and the drains, an additional and distinct set of tubes has been incorporated in the first heater shell.

A temperature-actuated valve at the discharge of the circulator pump permits the rate of water flow to change so as to maintain an approximately constant air temperature to the main air preheater. This arrangement improves efficiency by utilizing the subatmosphere steam.

Another innovation is utilization of





the heat in the stack gases and the heat added by the induced draft fans to raise the main feedwater temperature. Feedwater, after passing through the separate drain cooler serving the third heater, enters a low-level economizer where it extracts heat from the stack gases to cool them to about 200F.

Seek 200F Gas

The following were considered in attempting a 200F stack gas temperature:

1. The low-level economizer will be installed downstream from the dust collectors in the gas circuit.

2. The cold end temperature of this economizer depends on turbine load, not on outdoor temperature. Temperature of the feedwater entering it will be 170F. Thus at no point will the gases come in contact with metal cooler than this value. This will be instrumental in prolonging tube life by eliminating extreme variations in the cold-end temperature.

3. The low-level economizer operates at modest pressure and can be built readily into several sections which can be isolated or completely bypassed in the event of trouble.

The flow in the cycle is as follows: starting at the condensate pump, feedwater is pumped through heaters to the deaerator. From the deaerator the LP feedwater pump picks up the water and delivers it through the HP feedwater heaters to the IP and HP feedwater pumps. After leaving the HP pump the feedwater passes through an excess-pressure control valve and a feedwater regulating valve. Between the two valves a portion of the water is tapped for desuperheater use. The excess-pressure valve is installed to provide a constant differential of about 30 psi across the feedwater valve. This will reduce the adjustment required of the feedwater control valve and the desuperheater spray control valves.

After passing the feedwater valve, the water enters the economizer, then the water wall portion of the once-through boiler, and finally the transition section. The steam leaving the transition section of the boiler will be slightly super-heated (900F).

From the transition section the steam passes through two superheater zones, the first being radiant surface in the walls of the furnace, and the second a finishing superheater made up of platens in the upper furnace cavity.

Between the boiler and turbine the steam passes through boiler stop valves. Primary function of these valves is associated with starting the boiler, but secondarily they are equipped with pressure and temperature sensitive controls to close in the event of too low steam temperature or too low steam pressure, thus protecting the turbine.

The turbine bypass system for start-up and trip off is described in the accompanying articles.

Size Affects Feed Pumps

The unit size and advanced steam conditions were the important factors determining the feedwater pumping arrangement. Based on these factors it was decided that pumping should be done in two or more steps with the

heaters which follow the deaerators located between the pumping stages. The heaters would thus be subjected to pressures within the range of present experience.

This meant the HP pumps would be handling water at very elevated temperatures. While this increases total pumping power, most of this energy is returned to the feedwater in the form of heat.

Steam Drives HP Pumps

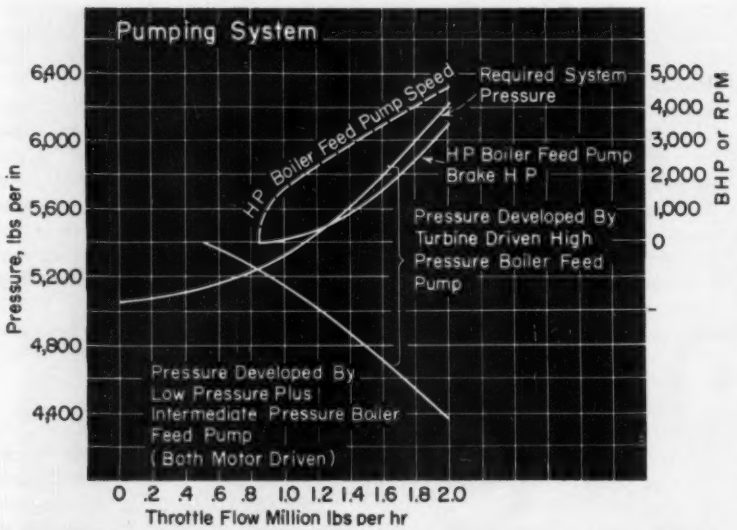
Steam turbines were selected to drive the HP pumps because of their simple variable-speed characteristics and wide choice of speed for optimum pump design. These characteristics were deemed important because with constant-speed pumps the pressure developed as load drops off would exceed normal full-load requirements. The alternate solution of using speed-varying equipment was dismissed because of the losses that would result with its use, particularly at low loads.

Feedwater pump power is supplied by three separate pumps in series with the HP heaters between the first and second pumps. LP and IP pumps will be direct-connected, constant-speed, and motor-driven. The IP discharges into the HP pump. These two motor-driven pumps have been selected so that the pressure they will develop in series, when taking advantage of the rising pump characteristics and the higher specific gravity of the water at light loads, will be adequate to circulate water through the boiler at more than one-third rating during the firing-up period.

Steam for the turbine driven pump will come from the first cold reheat of the main unit and exhausts to the second cold reheat. It will come on after the main unit is synchronized and operating at about one-third load. As load increases, the inlet and exhaust pressure of the HP pump turbine will rise in proportion. Hence, the turbine will operate at a constant pressure ratio with the available pressure differential increasing as the load increases.

Pump Speed Controls Pressure

The speed of the turbine will be controlled to provide the needed difference between the pressure developed by the two motor pumps and that required by the system. When the main unit trips off, the bypass system will function, the combination control will reduce the boiler output to one-third load, at which point the two motor pumps can handle the system requirement. Thus there will be adequate boiler feed pump power despite the fact that adequate steam is not available when starting and at trip off.



COMBINATION of turbine-driven and motor-driven boiler feed pumps provide adequate pressure for the boiler feedwater over complete range of throttle flow

As previously indicated the boiler feed pumps are in a series of three: low, intermediate, and high pressure. Each develops somewhat more than 2,000 psi at full load. At shut-off and at loads up to about one-third of full load the LP and IP pumps, operating without the HP pump, will develop more than 5,500 psi. The LP and IP pumps are driven at constant speed by two-pole induction motors, sized 4,000 and 4,500 hp respectively. The HP pump is steam turbine driven and capable of variable speed to satisfy the system requirements at above one-third rating. The feedwater pumps are in duplicate, each series being installed in one of the two lines of heaters. Thus a set of feed pumps and a line of feedwater heaters comprise a unit, any component of which could cause loss of half the feedwater cycle. The remaining units, however, will be capable of carrying feedwater flow adequate for about two-thirds plant capability.

Use 3 Demineralizers

For the makeup system at Eddystone it is proposed to use a two-bed and a mixed-bed demineralizer in series. The mixed bed will be in the downstream position to polish the effluent from the two-bed unit.

In addition to making full use of demineralizers for ridding the supercritical unit makeup of solids, the makeup quantity has been reduced by the installation of a set of separate house service boilers. These will supply steam for building heating, soot blower operation, and any other low-pressure steam requirements.

Building a tight condenser, detecting leaks, and providing a means for removing any contaminants which might get into the condensate stream are the major problems connected with the condenser. To provide tightness the tubes will be rolled into the tube sheet with a load controlled type of roller and covered with a rubber-like coating.

A bypass demineralizer system will treat condensate, should it become contaminated because of tube leakage. It is felt that this demineralizer should have a capacity equal to at least one-third the total condensate flow. Although expensive, this is deemed necessary because of the stringent purity requirements of the feedwater. The accompanying schematic diagram in-

dicates the arrangement.

In operation the sweet-water tank will be full, and the bitter-water tank initially empty. The tanks will contain about 2-hr capacity, so that load can be dropped to the capacity of the demineralizer, or other arrangements can be made.

Leakage Detection Difficult

The problem of leakage detection is difficult. First, conductivity detectors have a sensitivity which, in the course of a year, would permit the undetected addition of about a half ton of solids to the boiler. This would appear to be too much. Second, there is the problem of distinguishing between increased conductivity because of leakage and that due to the chemicals added for feedwater conditioning. The latter will probably be a volatile, such as hydrazine or ammonia, which is expected to follow through the entire cycle and therefore have a considerable effect on the condensate conductivity.

Leakage detection will be handled by installing a tray under the condenser tubes, which will be baffled into about 20 compartments, and by providing troughs on the inside of each tube sheet. Each compartment and trough will return to the hotwell through a pipe in which will be installed an individual conductivity cell. Thus any tube leakage will be concentrated by a factor of 20 as it flows into just one compartment, and any leakage at the tube roll should course down the inside of the sheet into the trough. This arrangement should provide a means of distinguishing leaks because, if variations in conductivity are due to chemical water treatment, all cells should indicate simultaneous changes; whereas a leak should show up in only one or two compartments.

Hotwell Is Divided

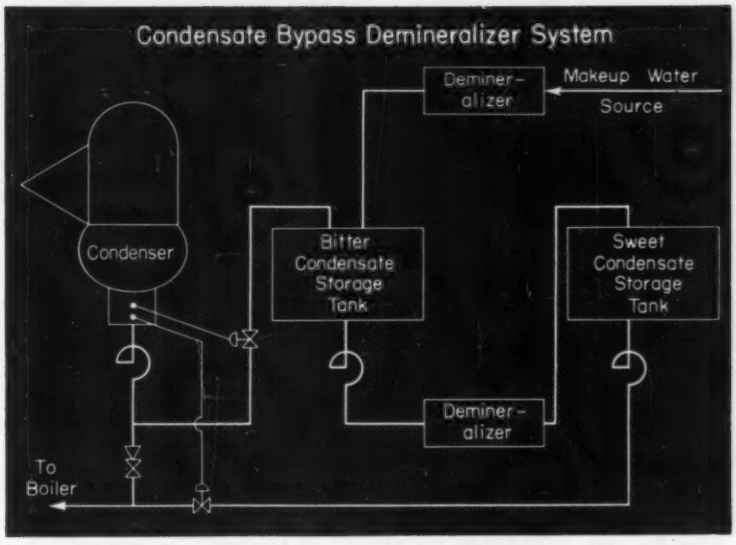
Compartmentalizing the condenser hotwell will make it possible to arrange the condensate pumping so that one pump can be set to pump all the water in one-third of the condenser. Thus, when a leak occurs, it would be possible to pump the affected third through the condensate scrubber demineralizer. The other two-thirds of the condensate would be pumped directly to the heat cycle.

The 5,000-psi, 1,200F piping will be made of Type 316 stainless steel using the allowable stresses included in the 1952 ASME boiler code. The finishing superheater and supercritical turbine rotor will be made of the so-called super alloys.

Having selected a material, the next step was to set certain design criteria for determining the number and size of the pipes and the fabrication procedure.

The number of main steam pipes was very largely determined by the fact that the monotube boiler employs eight parallel circuits through the superheater zones and is therefore equipped with eight stop valves. Each valve is connected to a superheater outlet with an individual line which terminates at the mixing header. Four lines carry the steam from the mixing header to the turbine.

In deciding upon the pipe size, the desire to keep pressure drop down and thus lower boiler pressure so as to aid in the problems incident to pressure in the boiler and to reduce boiler feed pump discharge pressure with a resulting saving in pump power were considered. On the other hand, the cost limited the pipe size that could be used. Another consideration was that pressure drops corresponding to steam velocities are excessive because of the great density of supercritical-pressure steam.



CONDENSATE contaminated because of tube leakage can be treated in bypass demineralizer. Capacity of this system is equal to one-third total condensate flow

A compromise of these opposing factors resulted in selecting a superheater outlet pressure of 5,300 psi. This allows a 300-lb drop through the piping and valves to the turbine throttle. At 5,300 psi, the superheater outlet steam temperature would be 1,210F to attain 1,200F at 5,000 psi at the throttle.

To conserve material, the pipe run from the superheater outlet to the turbine was divided into two zones. That portion to the boiler stop valves will be designed for 5,300 psi and 1,210F. That downstream from the stop valves will be designed for 5,150 psi and 1,205F. Under these conditions the straight pipe in the eight-pipe portion to the boiler stop valves will be 8.75 in. OD with a 2.344-in. wall. In the four-pipe portion the OD will be 10.312 in. and the wall 2.656 in. thick. The pipe, made by the forged and bored process, will be produced in lengths averaging about 20 feet.

Generators Are Bused

The two generators of the cross-compound set will aggregate 416 Mva and will generate at 20 kv. They will be solidly connected to each other electrically and to two 200-Mva step-up transformers with an output potential of 132 kv.

The two main step-up transformers will be connected solidly on the 132-

kv side. Their output will be controlled by a single breaker serving a single 132-kv bus. The 132-kv bus will supply three outgoing lines, a transfer bus to unit No. 2 and a 132/4-kv starting transformer.

Eddystone Plant is on a 100-acre tract with about 1,400-ft frontage on the Delaware River in Eddystone Borough, just east of Chester and somewhat west and south of Philadelphia.

Piles Bear on Rock

The tract is largely underlaid with river silt. But good rock about 50 ft below grade will permit the plant to be built on H-piles driven to refusal. The up-river or east property line borders a small creek which will be used as part of the circulating water discharge system. The property line along the creek, inshore from the circulating water discharge connection, will be contained by a row of sheet piling tied back to dead men. The part of the property line on the creek from the circulating water discharge connection to the river and the river front will be formed by a cellular type bulkhead. A portion of the plant site is under water and is filled with silt which has essentially no bearing capacity.

This is in the area where it is planned to establish the reserve coal pile. In order to make this location usable it is proposed to remove the silt to a level about 15 ft below finished grade and fill the area hydraulically with sand and gravel pumped in from dredging operations in the Delaware River. With this arrangement, it is anticipated that settlement will be limited to a reasonable amount.

Both the turbine and generator will be enclosed. The boiler plant will be enclosed using, for the most part, uninsulated corrugated aluminum siding. This type material has been found to be quite satisfactory and reasonable in cost in recent plants where it has been used. The decision to enclose the boiler plant resulted from an analysis of experience in building two semi-outdoor boiler plants recently. The evidence is that the cost of totally enclosing the boiler plant with uninsulated siding of this type will be offset by the cost of building and removing temporary enclosures required during construction, the cost of poviding devices to prevent freezing, and the cost of non-productive man-hours due to working outdoors.

Further, a once-through boiler has many undrainable tubes. Although most tubes are at the burner and hopper levels, which normally would be enclosed under any circumstances, and arrangements could be made to prevent the possibility of freezing of other parts during shutdown, this fact provided all the incentive needed to tip the balance in favor of an enclosed plant.

Normal fuel for this station will be bituminous coal received by rail. Thaw pits and a car dumper will be used. A system of conveyor belts, crushers, and trippers will deliver the coal to the bunkers, or to a "live" storage pile. Enough coal can be retained in the "live" storage pile to operate the two-unit plant at full load for three days. Insofar as this storage is located over hoppers, it can be reclaimed by the plant crew without additional help or equipment. The total storage area on the property will be adequate for a coal reserve equivalent to 70 days operation. This will be made by moving coal from the "live" storage pile with carryalls and bulldozers.

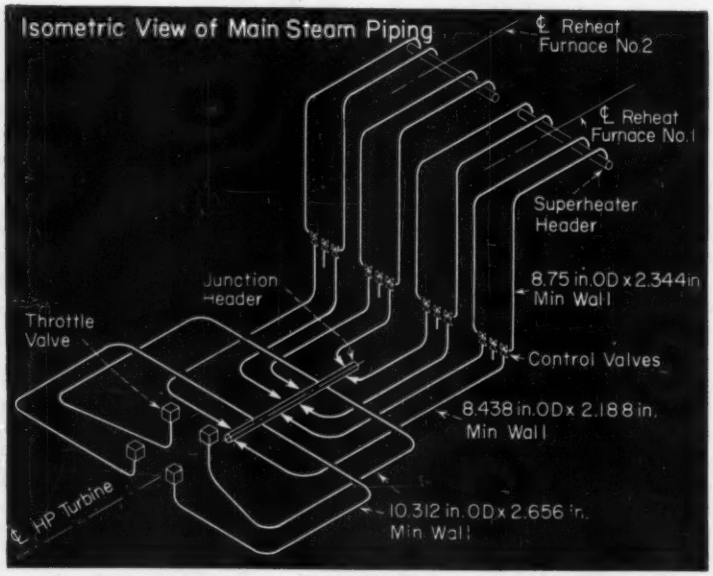
If and when this plant is enlarged to include more than two units, provision will have to be made for barge delivery and unloading of the coal. The bulkheading is designed to allow for such an arrangement, although coal handling facilities for this purpose are not being installed at this time.

Bunkers Hold 24-Hr Fuel

The boiler will have two bunkers, one on each side with an aggregate capacity equivalent to 24 hr. Directly beneath each bunker will be the four pulverizers serving the furnace on that side of the boiler. With the two-furnace arrangement and tangential firing, this works out very well and simplifies the fuel piping. It also opens up the front of the boiler toward the turbine to provide space for the many main steam and hot and cold reheat lines.

The boiler will have both centrifugal and electrostatic types of fly-ash collectors. Fly ash will be transported from the collectors to receiver tanks located at a distance from the plant in an attempt to prevent dusting the plant and its equipment.

Furnace-bottom slag will be accumulated in wet hoppers and transported hydraulically. Fly ash and slag can be removed from the property either by rail or barge.


Isometric View of Main Steam Piping
℄ Reheat Furnace No.2
℄ Reheat Furnace No.1
Superheater Header
Junction Header
8.75 in.OD x 2.344 in. Min Wall
Throttle Valve
Control Valves
8.438 in.OD x 2.188 in. Min Wall
℄ HP Turbine
10.312 in.OD x 2.656 in. Min Wall

ALTOGETHER about 2,400 ft of Type 316 stainless steel main steam piping will be used. This piping will be produced in lengths averaging about 20 ft

Because of Supercritical Pressure Operation . . .

Once-Through Boiler to Be Used

Unit consists of two identical dry-bottom-type furnaces, each fired with corner tangential burners. The reheaters are controlled independently

E. M. POWELL, Exec Ass't to VP & Director of Engr., Combustion Engineering, Inc., New York, N. Y.

The steam generating unit for Eddystone No. 1 is designed to deliver steam at a pressure of 5,000 psig, at a temperatue of 1,200F, and at a rate of 2,000,000 lb per hr. There are two stages of reheat, both at 1,050F.

The design, using standard components as far as practicable, follows the pattern of two-furnace units for capacities of 200 Mw and up. Exceptions are the once-through flow of water through the pressure parts and the high-temperature, high-pressure superheater design.

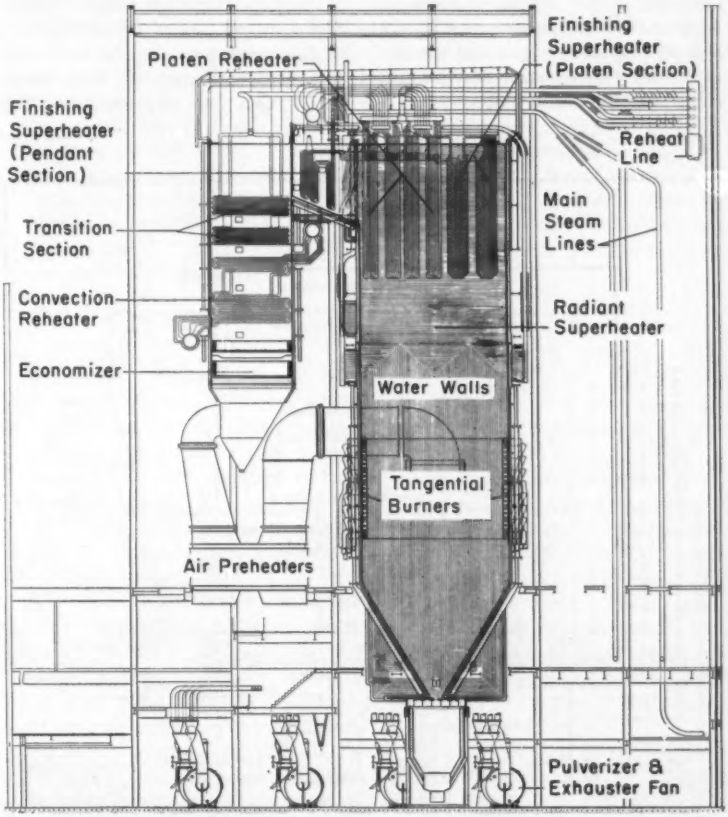
This unit consists of two identical dry-bottom-type furnaces, each fired with corner tangential burners. The reheaters in separate furnaces are controlled independently by burner tilt, thereby avoiding spray desuperheating. This will allow maximum cycle efficiency and constant reheat temperatures over a wide range of ratings.

Sixty five per cent of the heat absorption will take place in the superheaters and reheaters. This means use of more radiant superheating surface than with designs for lower pressures and temperatures. This heat absorption ratio led to installing radiant superheaters on the upper furnace walls and extensive use of widely spaced platens suspended in the upper portion of the furnace. Sufficient cooling surface has thus been provided to cool the gases to about 1,650F before they leave the furnace chamber and enter the finishing superheater.

The heating surface for the high-pressure circuit is the same in each half of the unit. Feedwater enters the economizer and flows upward through tubes cooling the side walls of the convection pass. It is collected in a header on each side wall and piped to tubes covering the lower furnace walls. These up-and-down circuits terminate in two headers at the center of the front wall. This water is taken to the convection surface at the rear-pass top through tubing which cools the front and rear walls of the convection pass.

The transition from water to steam occurs in this zone of low gas temperature and reduced heat transfer. Two separate circuits have been maintained through this point for each furnace, making a total of four circuits. Each has its own control system to maintain uniform metal temperatures and to match the water flow to heat absorption as required.

Each circuit is then subdivided into two through piping and then directed to the radiant superheater which forms the walls of the upper third of the furnace. These circuits are a series of horizontal tube circuits to the roof. Final superheating is in the platens in the upper front corner of the furnace and in the convection pendant loops just beyond the furnace outlet. Thus superheating to 1,200F will be done in a zone of minimum gas temperature compatible with the steam temperature from the standpoint of heat transfer. This results in mini-



TWIN-FURNACE STEAM GENERATOR to be used will have adequate cooling so that sticky ash deposits in closely spaced convection surfaces will be avoided

Adapted from a paper presented by the author at the annual meeting of the American Society of Mechanical Engineers, New York, N. Y., Nov. 26-30

mum metal temperature. Heating the tubes around their entire circumference serves to reduce temperature stresses in the tube wall.

Each furnace has a complete reheater. Steam from the turbine, entering at the rear, is heated in two stages —by convection in the rear pass immediately above the economizer, and by radiation in the platens at the furnace top. Four air heaters, two per furnace, and a symmetrical duct system will be so arranged that air supply to the two furnaces may be controlled individually.

To obtain minimum tube wall thicknesses and minimum stresses consistent with high pressures and temperatures, 1½-in. dia tubes will be used throughout the high-pressure circuits. It is not considered practicable to weld tubes together continuously because of the variable temperatures involved. It is planned to exploit fully the advantages of preassembly.

The most important single function of the control system for this cycle is steam-temperature regulation. Not only does this apply to final steam temperature to the turbine but throughout the circuit, if optimum metal temperatures are to be achieved in the pressure parts and a long service life assured.

Four independently controlled circuits are used from the economizer inlet to the outlet of the transition section, each a number of parallel tubes. At this point each system divides into two circuits, each with independent water-injection controls. Headers are provided at four intermediate points where flow through each circuit may be thoroughly mixed before passing to the next heating-surface section. Control devices are at these points. The combination of positive controls and mixing headers assures uniform temperature distribution throughout parallel circuits.

The control system has three primary functions:

1. Feedwater flow and distribution are directly associated with steam temperature regulation.

2. Bypass system is regulated for protection of turbine and steam generator during starting and emergency conditions.

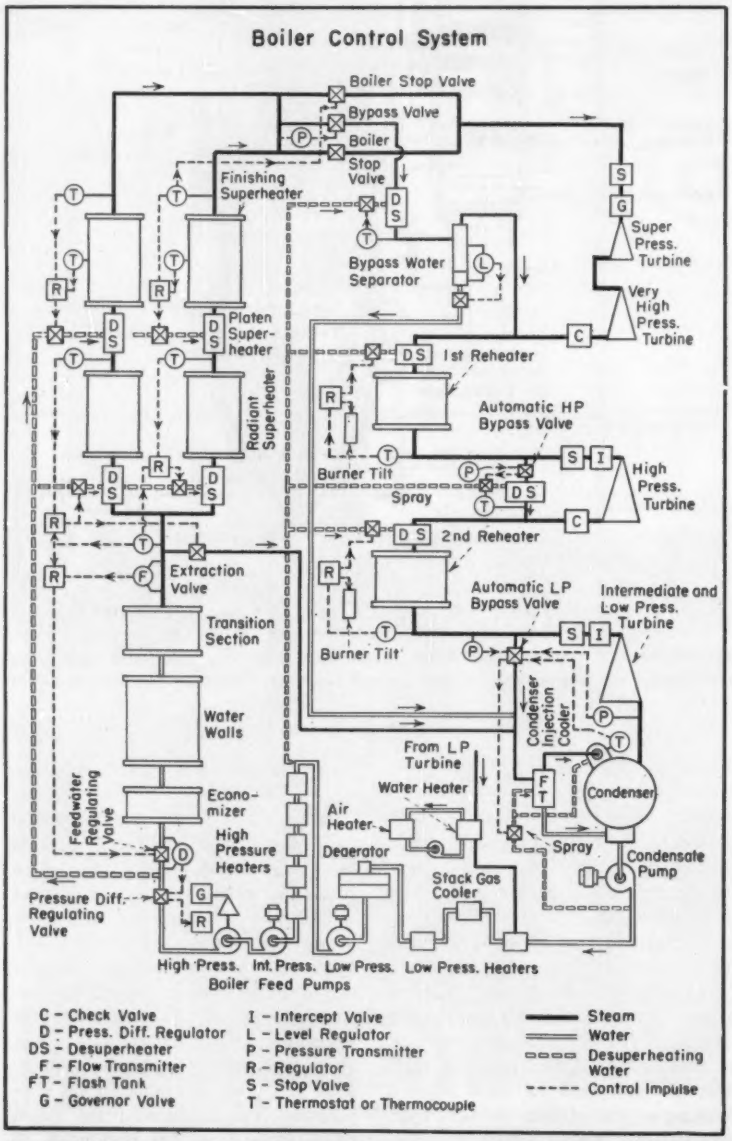
3. Combustion controls are interconnected to turbine to satisfy needs of generator output and pressure regulation.

Steam temperature is regulated at the outlets of the transition section, radiant superheater, and finishing superheater. Advantages anticipated with this system are: A more positive control of throttle temperature will minimize fluctuations and temperatures will be more completely controlled throughout steam generator.

Feedwater flow to the economizer is regulated by an inlet valve. Flow is a direct function of valve position. An anticipating impulse from steam flow is provided by the pressure differential across a flow nozzle in the steam piping leaving the transition section. This will sense immediately any change in steam flow to the turbine. Final impulse comes from a thermostat at the same location, correcting the feedwater flow to maintain steam temperature.

Pressure drop across the feedwater regulating valve is maintained constant automatically by a pressure-difference regulating valve immediately ahead of it. This compensates for variations in feed pump and boiler pressure, so that feedwater quantity depends only on the feedwater valve setting.

Final steam temperature is regu-



BYPASS SYSTEM provides cooling of all heating surfaces during startup of the once-through steam generator. Hydraulically operated valves will be used

lated by means of water injection at the inlets of the radiant superheater and the platen section. These are in effect three-element controls. The first stage functions as follows: **1.** Water is taken from the feed line between the pressure-difference valve and feedwater regulating valve. Pressure here is a direct function of load so that, for a given opening of the injection valve, water flow will be in direct proportion to steam flow. **2.** Thermostat at the transition section outlet provides an anticipating impulse to the injection valve on change of firing rate which produces a change in steam temperature there. **3.** Final vernier regulation of the injection valve is through the thermostat at the radiant superheater outlet.

The second stage functions similarly. Injection water, taken from the same source, is injected through the valve under control of the thermostats between loops of the platen surface and superheater outlet.

The integrated boiler-turbine combustion-control system regulates the turbine governor and the input of fuel and air to the boiler. This regulation will give the required generator output while maintaining uniform steam pressure. Two basic methods may be used. The operator may select either through a transfer switch.

1. Direct Energy Balance Method: Input of fuel and air supplies to the boiler is directly regulated from unbalance between required and actual generator output, while turbine governor is controlled to maintain a uniform steam pressure. With this arrangement boiler input is directly controlled to give desired generator output, and the turbine keeps in step.

2. Conventional Method: Turbine governor is regulated to give required generator output while boiler input is controlled to maintain steam pressure. Combustion rate anticipation is obtained from the generator output, plus the regulation applied to the governor motor. With this arrangement the boiler follows the turbine demand.

As a further means of coordinating overall operation of the unit, the combustion control system employs a "boiler-turbine governor" component. It provides a means of changing boiler-turbine output in an orderly manner, and keeping output within capabilities of boiler and turbine.

This component integrates and supervises operation of the boiler and turbine as a unit. It is composed of "load-setter", "frequency," and "required-load" servos. These are analogous to the synchronizing motor, speed-sensitive element, and turbine valve position of a standard turbine governor. Included is a rate-sensitive element to limit the maximum rate at which the required output can change. The boiler-turbine governor is provided with limiting and runback actions to keep output within the capabilities of the boiler and turbine auxiliary equipment. This system is used with either method of control.

A turbine bypass system will cool adequately all heating surfaces during cold starting and will permit development of proper characteristics of steam before its admission to the turbine. This system will be used during a hot restart of the boiler and for protecting boiler and turbine in abnormal operating situations.

Steam bypasses the turbine through the automatic superpressure bypass valve, the bypass water separator, the first reheater, the automatic high-pressure bypass valve, the second reheater, and the automatic low-pressure bypass valve to the condenser cooler and the condenser. When starting cold, water will be pumped through the entire boiler circuit to the bypass system. It will be removed from the bypass water separator and discharged to the condenser hot well through a flash tank.

The boiler stop valves will close on low-temperature or low-pressure impulses to prevent admission of wet steam or water to the turbine. The superpressure bypass valves serve also as relief from over-pressure or over-temperature.

The entire turbine bypass system will permit boiler operation at 30% of design capacity with full primary steam pressure and temperature and the turbine isolated completely. Some heat will be recovered in feedwater heating through normal extraction lines. Thus it will be possible to match steam temperatures to those at the three admission points to the turbine before starting a hot machine.

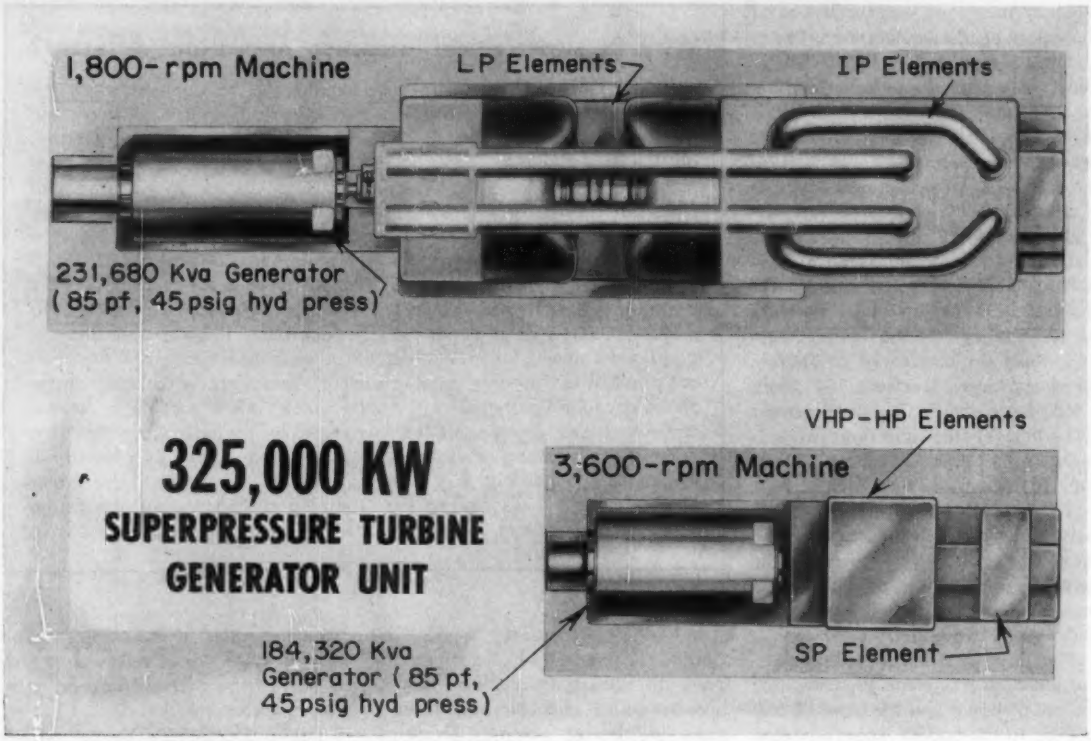
Following a turbine tripout when outage is expected to be relatively short, sufficient water will pass through circuits in the lower furnace for their protection in the burner zone. At the same time the quantity passed through the high-temperature superheater tubing and main steam piping to the turbine will be reduced. This will minimize temperature shock to that material and recover temperature more quickly. It will be accomplished by extracting steam from the circuit at the inlet to the radiant superheater. The control valve in the extraction line will be regulated automatically by the steam temperature leaving the radiant superheater.

The high-pressure system and each reheater will be completely protected by safety valves with full-load relieving capacity. It is intended, however, that the bypass system will operate in such a way as to minimize the occasions when the safety valves must operate.

Why is supercritical pressure operation different?

At pressures above the critical point there is no point at which the temperature will remain constant with a change of heat input. There will be a continuous change in specific volume as the temperature increases, but there is no sudden change in volume at a given temperature as at pressures below the critical point. The fluid has the characteristics of water for a certain range of temperatures. At high temperatures, it behaves as superheated steam. Steam tables will show that there is a transition zone which begins at approximately 850F at 5,000 psi.

Because of these physical considerations there is no point throughout the length of a heated circuit where water and steam can exist as a mixture. Designs which depend on the separation of water from steam in a drum for recirculation through the evaporative circuit are therefore not applicable. The only suitable selection is a forced-circulation design of the once-through type. For the same reason it is impossible to concentrate impurities, which enter the feedwater, by partial evaporation in a boiler drum and then remove them from the system through a blowdown system. Not only does this require a revised approach to feedwater purification but it also affects the operating procedures and the design of the control system.



Cross Compounding Regarded Best

Provides best heat rate. Reheat used to avoid excessive exhaust stage moisture and to increase efficiency as well

C. B. CAMPBELL, C. C. FRANCK, SR, J. C. SPAHR, Westinghouse Electric Corp, Lester, Pa.

Steam cooling of the highest temperature turbine element and the design used so that a minimum amount of expensive super-alloy material would be needed are outstanding features of the 325-Mw cross-compound turbine for the Eddystone supercritical-pressure plant.

The turbine is designed for inlet steam conditions of 5,015 psia at 1,200F, with two stages of reheat to 1,050F. It will exhaust at 1 in. Hg abs. Feedwater will be heated regeneratively to 567F at rated output, this temperature increasing to about 576F at the discharge of the HP boiler feed pump.

Adapted from a paper presented by the authors at the annual meeting of the American Society of Mechanical Engineers held at New York, N. Y. Nov. 26-30

Main flow of steam is through the superpressure (SP) and the very high pressure (VHP) elements, the first reheat stage, the high pressure (HP) turbine stages, the second reheat stage, and the intermediate (IP) and low pressure (LP) turbines to condenser.

The rather small volumetric steam flow at the turbine inlet stage and relatively very large flow volume at the exhaust blade were two main considerations in designing the turbine. The HP elements operate at 3,600 rpm, the LP at 1,800 rpm. The 1,800-rpm, double-flow LP element was chosen to minimize exhaust-leaving losses and obtain optimum overall station heat rate.

The portion of the turbine expanding steam from inlet pressure to the first reheat point is split between two elements to secure the smallest practicable element which would be subjected to steam pressure or temperature beyond present experience. Advantages of this design include:

1. Greater latitude in selection of high-temperature alloys, some of which are not available in large sizes.

2. Use of conventional casing design principles.

3. Relatively short and small diameter rotor.

Steam at 5,015 psia and 1,200F is supplied to the SP turbine through four inlet lines, each having its own stop and governing valve. Each inlet is connected to one of four nozzle chambers which provide full circumferential admission to the first of five impulse stages. The first stage of this turbine element is designed for operation with complete admission at all loads.

The SP element is practically spherical. It is a casting of ferritic steel horizontally split and flanged and is center-line supported on the adjacent pedestals. In turn, it provides center-line support and key guidance for an inner casing of cast austenitic steel, type 316.

Two steam inlets are in both the inner and outer casing, covers, and bases. These pipes of austenitic, type 316 alloy are connected to the outer casing through transition pieces and welds. Prolongations of the inlet pipes extend into the nozzle chambers through slip joints.

For some distance these pipe extensions are parallel and close to the outer casing, transition piece, and its welds. To shield the latter from 1,200F inlet piping radiation, baffles are placed between the inner pipe and the outer casing snout. They consist of spirally surfaced cylinders surrounding the pipes, supplemented by orificed steam leakoffs from the casing end of the transition pieces and terminating in the VHP turbine. Consequently, the 1,000F, SP turbine exhausts steam flows outward and then inward along the cylindrical baffle to the VHP unit. The steam provides adequate cooling without a significant loss in thermal availability.

To assure that radiation from the inlet portions of the inner casing will not cause excessive heating of stagnant steam and too high a temperature in the ferritic outer casing in this vicinity, an auxiliary exhaust pipe has been provided on both the outer casing cover and base at this end of the SP turbine element. These pipes go back into the main exhaust pipes from the SP turbine element.

Steam is supplied to the SP turbine through four main leads of 5-in. ID by 10-5/16-in. OD. Each inlet of these leads has stop and governing valves. Type 316 CrNiMo steel has been used for all components of the SP turbine in contact with initial steam temperature or pressure.

The next main turbine component in series is that designated as VHP-HP. This unit houses two complete and independent elements. At maximum flow, the SP turbine exhaust into the VHP element is at about 2,500 psia and 1,000F. In turn, the VHP stages exhaust to the first reheater at 1,133 psia and 790F. This is also the point at which steam is extracted to supply the ninth or top regenerative feedwater heater and the HP boiler feed pump turbine. Steam returning from the first reheater at 8% reduced pressure and 1,050F, expands through the HP turbine stages to the second reheater at maximum flow pressure of 283 psia.

HP Element Split

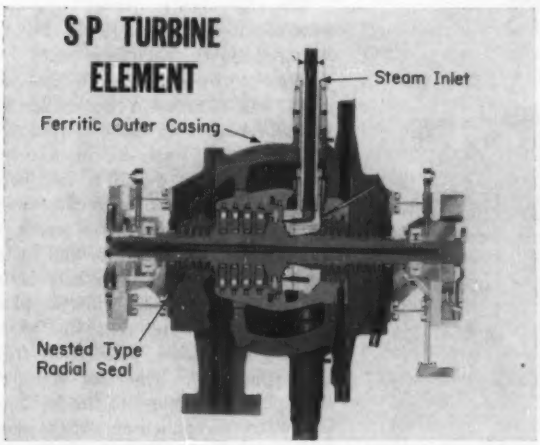
The VHP element is in the center of the turbine; steam flow is away from the SP unit, and its thrust is completely balanced by a labyrinth piston. The VHP element receives steam from the SP through two 8⅝-in. pipes. Steam is exhausted from the VHP element through four 12-in. pipes and sent to the first reheater section of the boiler. Steam returns from the first reheater through two 16-in. leads, each equipped with a stop valve. These leads are split to supply four 10-in. interceptor valves on the turbine casing.

The HP element is split to provide opposed-direction, series flow through turbine stages at each end of the combined unit. Splitting the HP flow path obtains self balancing insofar as thrust is concerned; further, it provides steam flow at intermediate pressure and temperature between inner and outer casings to absorb inlet packing leakage and perform a mass flow cooling function for the outer casing. The exhaust of the HP turbine is returned to the boiler for the second stage of reheating through two 24-in. lines.

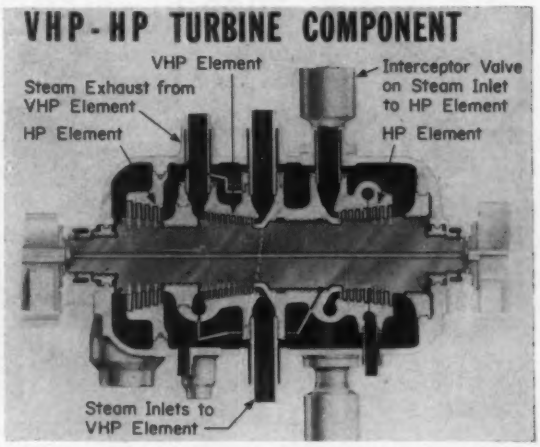
The design complexity of the turbine can be appreciated by the fact that the two 8⅝-in. ID inlet pipes to the VHP, the four 12-in, nominal cold reheat pipes, the four 10-in. nominal hot reheat pipes, and the extraction line to the eighth feedwater heater are connected to the inner casing through slip joints. To complicate the outer casing design provision must be made for an additional extraction point which supplies steam to the seventh feedwater heater, and two 24-in. pipes to the second reheater. Steam from this point is utilized in the sixth feedwater heater. Thus, there are fourteen major steam pipe connections to the VHP-HP turbine casing.

Steam from the second reheater returns to the IP turbine, which in connection with the LP turbine, comprises the 1,800-rpm shaft. The double-flow design principle is used for the IP turbine with steam admission at the casing center. This construction results in the most advantageous arrangement from considerations of the rotor forging and the casing structure.

The steam is supplied to the IP element at 251 psia and 1,050F, through four 20-in. pipes. The large expansion of the steam inlet pipes necessitates the use of an expansion joint. The



SUPERPRESSURE TURBINE is steam cooled. A nested type of radial seal is used to seal the steam at the casing end



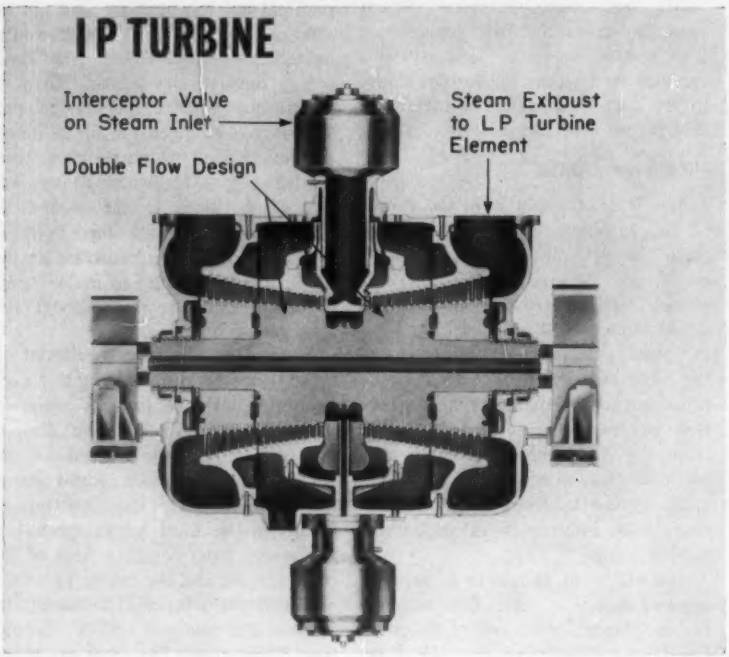
VERY HIGH PRESSURE and high-pressure elements are combined in one housing. HP elements are at each end of unit

"toroidal" type is effective at pressures and temperatures involved.

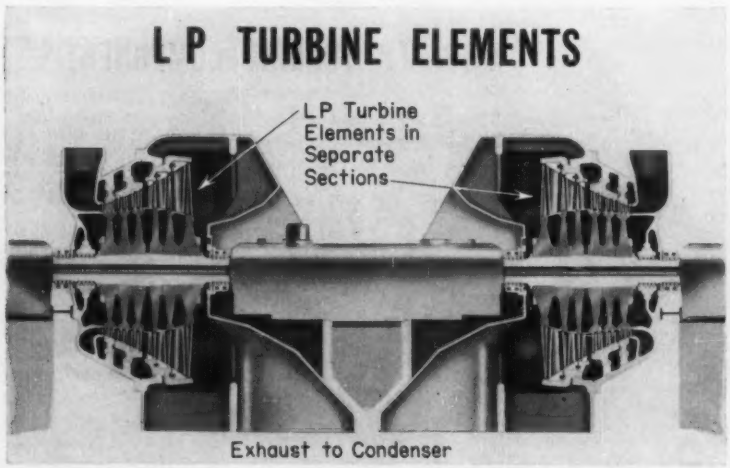
Inlet steam passes through four reheat stop valves and into the turbine through four interceptor valves on the turbine base and cover. The interceptor valves are similar to those used with the VHP-HP turbine.

Steam from the IP turbine element is exhausted through four 34-in. dia openings, two at the governor end and two at the generator end of the IP turbine. Steam is extracted from both ends of the IP turbine exhaust through an equalizer pipe so as to balance flow and pressure in this zone.

The LP element is designed for high capability and good vacuum conditions which require large exhaust annuli to minimize leaving losses. The large size of the last row of blades, if applied in the conventional double-exhaust arrangement, would result in a composite LP turbine rotor which would tax the capacity of conventional crane handling equipment. The size and weight would make handling during shipment difficult. To reduce the weight, the LP turbine element is in two separate sections.



BUILT-UP TYPE ROTOR is used for IP element. Center core of rotor forging is material that is suitable for operation at elevated temperatures encountered



SEPARATED SECTIONS of the LP turbine are placed with exhaust ends adjoining in order that the steam may flow into a condenser with a single inlet opening

Studies of the control system indicated that conventional operating oil-pressure units were inadequate to maintain reasonable proportions of servo-motors and would result in motive-oil requirements beyond the capacity of existing systems. A main operating oil-pump pressure of 300 psi was selected. Sufficient differential operating oil pressure is available to permit use of servo-motors of less than half the size required for existing design pressure levels.

The automatic steam generator stop valves are closed and protect the turbine at startup. When steam from the superheater is at the proper condition of temperature and pressure, the valves open. This opening can be prevented or limited by remote control. The valves can be cracked open sufficiently to preheat the main steam leads and be permitted to open as desired to bring the turbine into service. The valve will close automatically when pressure or temperature fall below set values.

Opens Automatically

During operation the superpressure bypass valves protect the steam generator and the turbine against high pressure or temperature. When the steam pressure in the main header rises 5% above normal, the bypass valve opens. The SP bypass valve is arranged to open automatically at a preset margin above normal temperature also. Its opening increases the steam flow and reduces the superheater outlet steam temperature.

The HP reheater bypass valve permits steam flow through the HP reheater during startups and in emergency trip-out of the turbine-generator unit. The valve opens when the pressure rises 5% above normal.

On startup, water circulation will be established at the 30% rate, with the flow passing through the steam generator to the SP bypass valve, to the bypass water separator and to the condenser. As the firing rate is increased, steam flashing will take place in the bypass water separator in increasing quantities. The steam from the bypass water separator will flow through the reheaters to the injection cooler, to the condenser. At the same time, water from the bypass water separator will flow through the drain

controller to the condenser. As the steam flow increases, the quantity of water decreases until it reaches stabilized steaming conditions in the steam generator. Then the entire 30% flow will be steam passing through the bypass system. Steam may then be admitted to the turbine.

When transferring steam flow from the bypass system to the turbine, flow to the turbine must be controlled at the main steam, first reheat, and second reheat inlets. The interceptor valves must act as control valves until the entire bypass flow is transferred.

When starting the turbine, there will be a parallel flow of bypass steam to the condenser. As flow to the turbine increases, the flow through the bypass system decreases until the entire bypass flow has been transferred. The main control valves are then in their 30%-flow position, the interceptor valves in the wide-open position as far as flow is concerned, and the flow-control valves in the bypass system closed.

Counter Load Loss

The bypass system provides protection during abnormal operating situations. On sudden loss of load, the turbine main inlet control valves and interceptor valves will close and the main and reheater bypass valves will open. Pressures in the turbine will drop automatically, adjusting the set pressures of the high and low pressures bypass valves to the 30% value. Closing the main inlet control valves will cause the main inlet pressure ahead of these valves to rise. The SP bypass valves will open, starting steam flow through the bypass system.

This steam is at full inlet temperature and must be desuperheated before entering the bypass water separator and the reheaters. A water injection valve controlling spray water injection ahead of the bypass separator is regulated automatically by the impulse from the thermostat so that the temperature of the steam entering the bypass separator will be limited to the full-load temperature of the turbine exhaust steam to the first reheater.

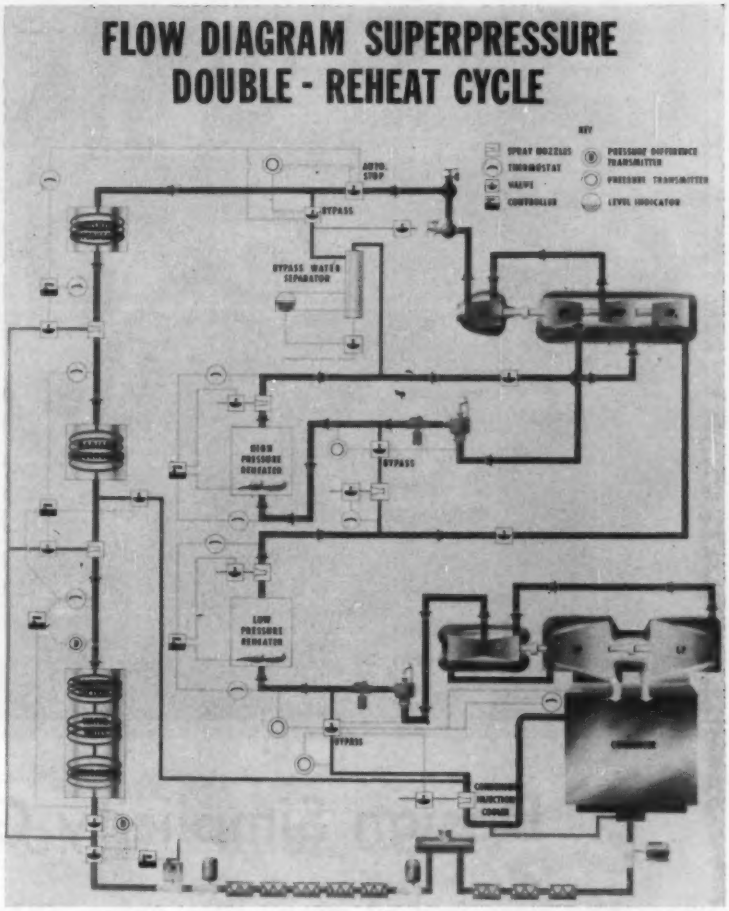
If, for any reason, the temperature of the steam rises to a predetermined amount above the normal maximum, the SP bypass valve will close. If these valves are closed under the emergency conditions of operation, the safety valves take over protection of the steam generator against excess pressure. A check valve in the cold reheat line prevents a back flow of steam to the turbine.

On closing the interceptor valves, the HP bypass valve will open, allowing steam flow to the second reheater. There is also a temperature controller at the discharge from this bypass valve, controlling spray water injection to limit the temperature of the steam to the normal full-load temperature of the turbine exhaust to the second reheater. A check valve at the second cold reheat line prevents a back flow to the turbine.

The LP bypass valve opens on closing of the interceptor valves, allowing steam flow to the injection cooler and condenser. Depending on the load loss, pressures in the second reheater could be as high as the relief-valve setting. If this were the case, opening the LP bypass valve to the wide open position would result in overloading the injection cooler and the condenser. But the pressure transmitter at the injection cooler inlet will limit the opening of the bypass valve to maintain the 45-psia design pressure at the injection cooler inlet. As the pressure in the reheater decays to the 30% flow level, the pressure transmitter will permit the bypass valve to continue to open to maintain the 45-psia pressure.

The SP element is connected in tandem with the VHP-HP component to drive the 3,600-rpm generator which is rated 184,320 kva at 0.85 pf with a hydrogen pressure of 45 psig. This generator is conductor-cooled.

The IP turbine is connected in tandem with the double-flow LP turbine to drive the 1,800-rpm generator which is rated 231,680 kva at 0.85 pf with a hydrogen pressure of 45 psig.



ONCE-THROUGH steam generator requires turbine bypass system in order to provide desired characteristics in cold starting, to permit hot quick restart of the boiler, and to provide protection under the abnormal operating circumstances

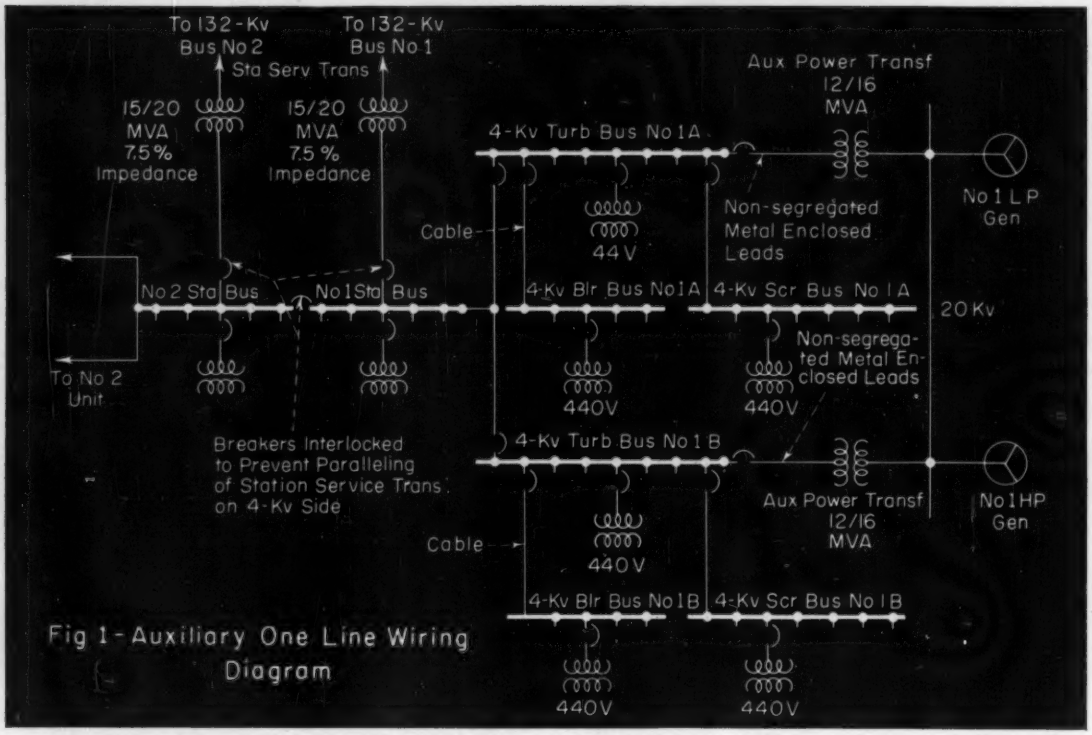


Fig 1 - Auxiliary One Line Wiring Diagram

Design Simplicity Gives Reliable

Two turbine buses feed all others in the station. Only turbine buses are connected to an emergency power source

F. W. A. MYERS, Philadelphia Electric Co, Philadelphia, Pa.

Relative simplicity of connections between buses and absence of complex automatic throwover schemes for emergency supply characterize the auxiliary supply system for Eddystone unit No. 1. Total auxiliary power requirements are about 27 Mva, not including that of two 5,000-hp, turbine-driven, high-pressure, boiler feed pumps. Unit No. 2 will require 25 Mva. Other features are two auxiliary power transformers connected to the generator leads and the new 3,000 amp, 350-Mva circuit breakers for station service sources.

Fig 1 shows that the auxiliary power system is supplied by two 12/16-Mva, 20-4-kv transformers directly connected to generator leads without switching equipment. Power for starting is supplied through the station service bus by two 15/20-Mva, 138Y-13.8-4Y-kv station service transformers from separate 132-kv buses.

Two auxiliary power transformers keep short-circuit duty on breakers below 250 Mva and the load through transformer breakers below 2,000 amp. This also limited the size of the station service transformers which will serve as an emergency source after auxiliary power transformer failure. Each auxiliary power transformer supplies one of two turbine auxiliary power buses. The buses supply boiler feed pumps, exciters, feeds to the boiler auxiliary power buses, screen-basin buses, and other accessory equipment supplied at 440 v through step-down transformers.

Two boiler buses provide power to forced and induced draft fans, pulverizers, and smaller accessory equipment supplied at 440 v through transformers. Each boiler bus is supplied by a feeder from one turbine bus. Two screen-basin buses supply circulating and river water pumps, and accessory equipment supplied at 440 v through transformers. Each is fed from a turbine bus.

The station service buses power the spare exciter, coal preparation equipment, and ash disposal facilities, together with smaller accessories and lighting supplied at lower voltage through transformers. Feeds are provided from these buses to the turbine buses for starting and for auxiliary power transformer outage.

Station service transformers have about 7.5% impedance to limit the voltage drop to less than 20% of normal during periods when it is necessary to start boiler feed pumps with no generation at the station. This was important because of the starting requirements of the LP boiler feed pumps (4,000 hp) and the IP feed pumps (4,500 hp).

Maximum short-circuit duty on

Adapted from a paper presented by the author at Pennsylvania Electric Association Electric Equipment Committee meeting, Binghamton, N. Y., Oct. 4-5, 1956.

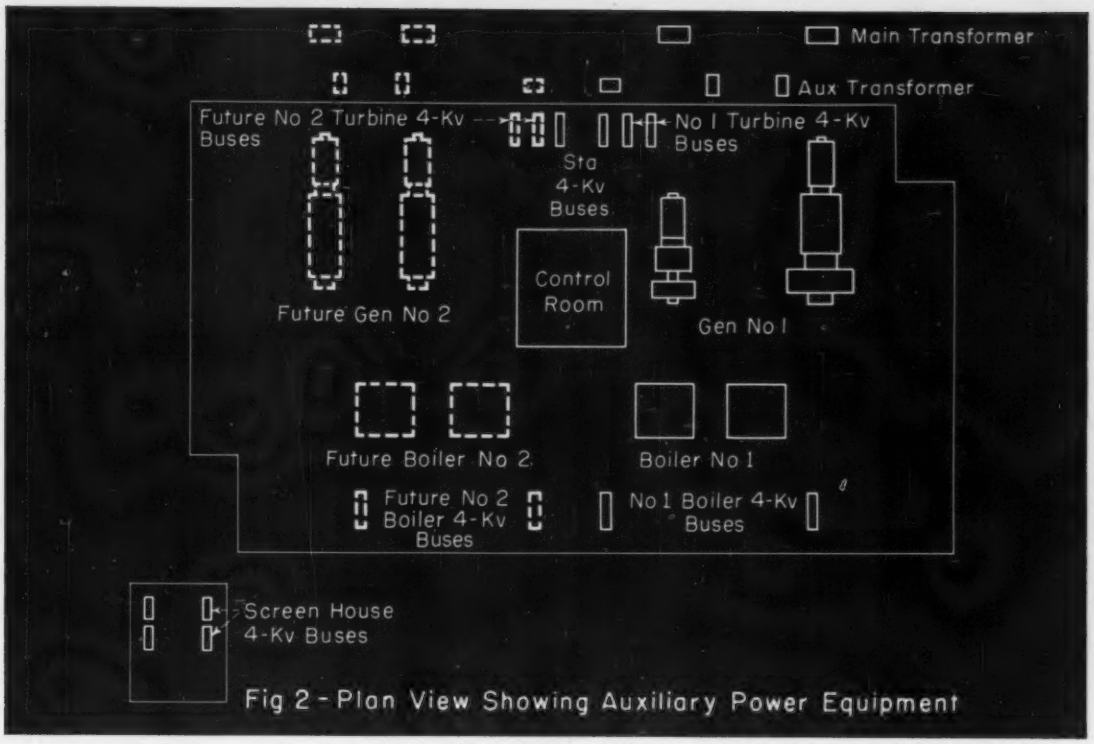


Fig 2 - Plan View Showing Auxiliary Power Equipment

Auxiliary Power at Least Cost

each bus supplied by a 15/20-Mva station service transformer is less than 250 Mva.

The duty would exceed the rating of 250-Mva switchgear if the two transformers were in parallel. For this reason, as well as to prevent paralleling 132-kv buses through the 4-kv tie connection, control of the breakers is interlocked. Thus the transformers can't be paralleled on the 4-kv side. Motors 300 hp and above are 4 kv. Those below 300 hp are supplied at 440 v, with a few exceptions.

Use of larger, 3000-amp, 350-Mva switchgear units has been avoided except on the transformer supplies to the station service buses and the tie between the buses. Maximum load on these is the combination of the common plant load (for two units) and the unit auxiliary power starting load which results in higher current than can be carried safely by a 2,000-amp breaker.

Basic plan of the auxiliary power system is simple with a minimum of emergency feeds. The supply is essentially radial. The only emergency supplies are the two from the station service buses to the turbine buses. One common feed is provided to the two turbine buses by a supply from the associated station service bus.

The 4-kv buses have been situated so as to keep the source as close to the load as possible with due regard to certain factors of location always present in a plant of this size. Turbine auxiliary buses, near the turbine room's in-shore wall, are connected to the outdoor transformers by non-segregated-phase metal enclosed leads. Arrangement is similar for station service buses. Boiler auxiliary buses at the opposite side of the building are supplied from the turbine auxiliary buses with non-leaded cables in non-metallic conduit.

Any boiler auxiliary power bus or its source feeder can be lost without main unit shutdown. Although this is true of the buses at the screen house, the unit is shut down when one turbine auxiliary bus is lost because the exciter for one generator is lost.

One spare exciter is provided for both this unit and future No. 2. It is supplied from either station service buses. Interlocks prevent tying station service buses together through breakers of the spare exciter. These will also prevent operation of the spare exciter with a generator other than the one which is to be connected to the same 132-kv bus. The latter bus supplies the station service transformer, a source for the exciter. The latter interlock is necessary to avoid loss of both generator units when a 132-kv bus fault occurs during use of the spare exciter in place of normal excitation.

The station service buses and transformers provide the source for operation of the unit auxiliaries during the starting period. When unit auxiliary load is to be transferred to its normal supply, auxiliary transformers will be paralleled non-automatically with a station service transformer. Similarly, when the main unit is being taken out of service, the station service transformer will be paralleled non-automatically with the auxiliary transformer long enough to open the supply from the unit auxiliary transformer.

How Manufacturers Look at

The Steam Generator Angle

Babcock & Wilcox Co supplied 4,500 psi, 1,150F/ 1,050F/ 1,050F SP steam generator for 125-Mw, Philo No. 6 unit.

W. H. ROWAND, Vice President, Babcock & Wilcox Co, New York, N. Y.

Why hasn't supercritical-pressure operation been used in this country until now?

Part of the answer is related directly not to supercritical pressure but to the once-through type of steam generator used when steam pressure is above the critical point. One big problem connected with the once-through steam generator has been lack of adequate water purification.

We believe we can now adequately and economically treat water for a system that does not provide separation of the water from and purification of the steam before it is superheated.

There is also a big economic factor which hindered the use of the once-through boiler operating at supercritical-pressure. To justify the higher steam pressures we should use higher temperatures. Until recently, we have not had materials for the temperatures used at supercritical pressures. Even now the austenitic material used is very expensive.

Returning to the once-through boiler it might be well to compare its development here with that in Europe, particularly Germany. In Germany this type of steam generator has been used since 1930. Since World War II a substantial percentage of units erected in Germany were of the once-through design for subcritical-pressure operation. The justification for this trend lies mainly in the ratio of material to labor cost which in Germany is much higher than here. The German labor cost to convert this material into equipment is only about ¼ as much as it is

The Turbine Generator Angle

General Electric Co supplied turbine-generator for 125 Mw, 4,500 psi, 1,150F/ 1,050F/ 1,050F SP Philo No. 6 unit.

CARL SCHABTACH, Manager-Engineering, and **C. W. ELSTON,** Manager-Turbine Engineering Large Steam Turbine-Generator Department, General Electric Co, Schenectady, N. Y.

Does the control system for a supercritical-pressure turbine differ from the system for a conventional unit?

Yes, mainly because of the once-through boiler. This type of boiler on startup discharges water at low temperature. As temperature rises, the water becomes steam. Meanwhile, a bypass must be provided to prohibit the water from entering the turbine.

The bypass valve system requires little area when it is controlling water on startup. But, as the density decreases with increasing temperature, a larger valve area is required. This situation is handled in the Philo No. 6 unit by having parallel valves arranged to open progressively.

How does a steam turbine designed for supercritical-pressure operation differ from a unit designed for operation at conventional temperatures and pressures?

The most obvious difference is that the shells housing the supercritical-pressure turbine section must be heavier. Another difference is that the nozzles and buckets in the supercritical-pressure section must be smaller because of the increased density of the steam. This is especially so in the Philo No. 6 unit, since this developmental unit is not of the optimum size for the steam conditions used. The lower-pressure stages of the turbine follow conventional design.

With the 1150F steam temperature in the Philo turbine, austenitic materials are necessary for certain parts. This material is expensive and more susceptible than ferritic steel to thermal stresses. Therefore, it was necessary to keep down the thickness and weight to minimize both thermal stresses and cost. Supercritical-pressure is not a direct factor here. But accommodating an increase in temperature at high pressure is more difficult than at low.

Is startup procedure more complex for a supercritical-pressure turbine than for a conventional unit?

We expect startup actually will be simpler. Admittedly, the equipment is more elaborate because of the turbine bypass system. But the once-through boiler has more flexibility as far as temperature is concerned. It can provide steam at a temperature matching the metal temperature of the turbine parts, thus overcoming one problem in starting a turbine.

Supercritical Pressure Operation

here. Thus the smaller tubes and drumless construction are more attractive there because savings in material cost outweigh the increase in the cost of fabrication labor.

Of course, the Germans have had trouble with tube failures because of oxygen, carbon dioxide and iron oxide in the feedwater. Recently they have prevented this by more complete degasification of the feedwater and adequate Ph control.

Do changes occur more rapidly in the once-through boiler than in the conventional natural-circulation boiler?

Changes do occur more rapidly. The steam generator of this type will be more sensitive to load changes or changes in fuel input. The once-through boiler does not have the fly wheel effect of the water storage in the steam drum and the large tubes of the conventional boiler.

But there is a compensating feature of this design—the ability to obtain any steam temperature at any load. Steam temperature control is easier because the transition point where superheating begins can change depending on the relationship between the steam flow and fuel input.

What are some of the basic differences in controlling the two types of boilers?

The best way to answer this is to state the two methods of control. The differences will then become obvious.

The steam pressure in the drum-type boiler is controlled by the rate at which fuel is burned. Steam temperature is controlled by gas recirculation, bypass dampers, attemperators, and burner position. And the water level in the drum is maintained by a balance between the feedwater entering the furnace and the steam flow to the turbine. The conventional boiler has a fixed amount of heating and evaporating surface. And it also has a fixed amount of superheater and reheat surface.

The absence of a drum eliminates one point of control—the drum level—in the once-through boiler. In this design the amount of surface for heating, evaporating, superheating, and reheating can change depending on feedwater flow and fuel input. The steam pressure controls feedwater flow, while amount of fuel burned is controlled to maintain final steam temperature.

(Continued on page 122)

What are some things you hope to learn at Philo?

Although the solids in the boiler water will be maintained at an extremely low level, we expect that these will carry over to the turbine. We want to learn what the effect will be on the turbine.

We also hope to learn more about the steam cooling system used for the high-temperature parts of the turbine. This scheme uses high-alloy material to enclose the high-temperature steam, but uses low-alloy steel to carry the major pressure load at low temperature.

The austenitic rotor, the bypass system, and the valve construction will be closely watched.

Do any new phenomena occur in steam expanding from supercritical-pressure?

No. There are no new aerodynamic or thermodynamic phenomena known or anticipated. It should be pointed out, however, that if the steam were expanded from 4,500 psig-1,150F, without reheat, to the normal condenser pressure of 1.5 in. Hg abs., the moisture in the later turbine stages would be excessive.

Does the use of supercritical-pressure present any difficult stop and control-valve problems?

Yes, supercritical-pressure presents some valve design problems. It would be possible to extrapolate conventional design practice using one or two stop valves, and four to six control valves. But this would result in stop valves with extremely thick walls in which high thermal stresses would be caused by moderate rates of temperature change. Excessive stresses in the Philo unit have been avoided by using four stop valves.

How will rapid load changes affect the turbine?

There is nothing to indicate that rapid load change will have any more effect on a supercritical-pressure than on a conventional turbine. However, rate of temperature change must be controlled.

It is interesting to note that loss of firing in the once-through boiler will result in very rapid drop in steam temperature, in fact, it could mean water from the boiler in 20 to 30 sec!

To prevent this occurrence at Philo, the turbine will be tripped at once when the boiler fire is lost. Stop and reheat valves will be tripped immediately upon loss of electric power to the boiler fuel supply or firing system. Backup protection also is provided by a sensitive over-and-under-limit steam temperature device.

What do you think of the future for supercritical-pressure application?

This is difficult, if not impossible to determine now. Our present state of knowledge indicates that, in the immediate future anyway, it will be less expensive to obtain higher efficiency in power plants by using higher pressures than by using higher temperatures. High temperatures still present unsolved metallurgical problems.

Are once-through boilers more difficult to control than the conventional type?

No. As indicated, the control systems differ, but investigations do not show any degree of difficulty between the two types of control. The once-through boiler may be considered more sensitive but there are fewer steps to controlling it. The differential cost of the two systems is about a standoff.

Why do the earlier announced supercritical-pressure installations have steam pressures well above the critical point, while the later announced installations have pressures at 3,500 psi?

In 1952 when the Philo installation was being considered, it was decided by the operating utility and the major equipment suppliers to go as high above current practice in temperature and pressure as was possible and still design the unit to meet ASME code requirements. The pressure and temperature meeting this specification were 4,500 psi and 1,150F. These steam conditions would permit use of commercial, type 347 stainless steel tubes and piping. This installation was to be a demonstration unit.

The later thinking of this same group has been to design supercritical units that would be more economical. To do this it was decided to use steam condition that would require a minimum use of austenitic material. These conditions are 3,500 psi and 1,050F.

Realizing that Philo No. 6 was not intended to be fully justified economically but was rather a pioneering engineering development, what is the unit size necessary to justify supercritical-pressure operation economically?

It is difficult to give a single numerical answer that will apply in all situations. Considering present fuel costs, and realizing that we will learn a great deal when some supercritical-pressure units are in operation, 300 Mw seems to be the size necessary to justify an increase in pressure from 2,400 to 3,500 psi.

Use of reheat in the conventional steam cycle increases the plant thermal efficiency about 5%. How much does supercritical-pressure operation improve thermal efficiency?

The answer depends on the steam conditions compared. For instance, in going from 2,400 psi, 1050F/1050F to 3,500 psi, 1,050F/1,050F there is an improvement in the heat rate of about 150 Btu per kwhr.

How much more expensive is a supercritical-pressure steam generator?

This answer depends on the steam pressures compared. But even taking these pressures into consideration, it is difficult to give a concrete answer because of insufficient fabrication experience with the type of boiler.

It is interesting, however, to examine the cost of steam generating equipment for 2,400 psi. Considering the steam generating equipment only, the once-through type is probably somewhat cheaper. But the cost advantage in the United States swings toward the conventional boiler when the additional start-up equipment, and higher pressure heaters and pumps necessary with the once-through steam generator are considered. Also to be considered is the cost of the additional pumping power.

What are some things you hope to learn at Philo?

We expect to obtain more information about the reliability of the plant. The water treatment facilities have proved to be satisfactory on a pilot scale, but we want to know whether a practical water treatment plant can prevent tube failure in a full-scale plant. We want to know more about the stability of operation and the control characteristics, and whether turbine deposits will occur.

Can a once-through boiler be shut down suddenly without damage in an emergency?

Yes. The fire will be tripped out automatically whenever the feed flow is stopped.

Is starting difficult with a once-through steam generator?

It is difficult, but not necessarily so. The once-through feature requires water flow through the unit whenever there is a fire in the furnace. This in turn necessitates a startup bypass system around the turbine.

Key Facts and Predictions about Supercritical Pressure Plants

1. Satisfactory operation of the once-through type of steam generator is the key to success in utilizing steam in the supercritical-pressure range.

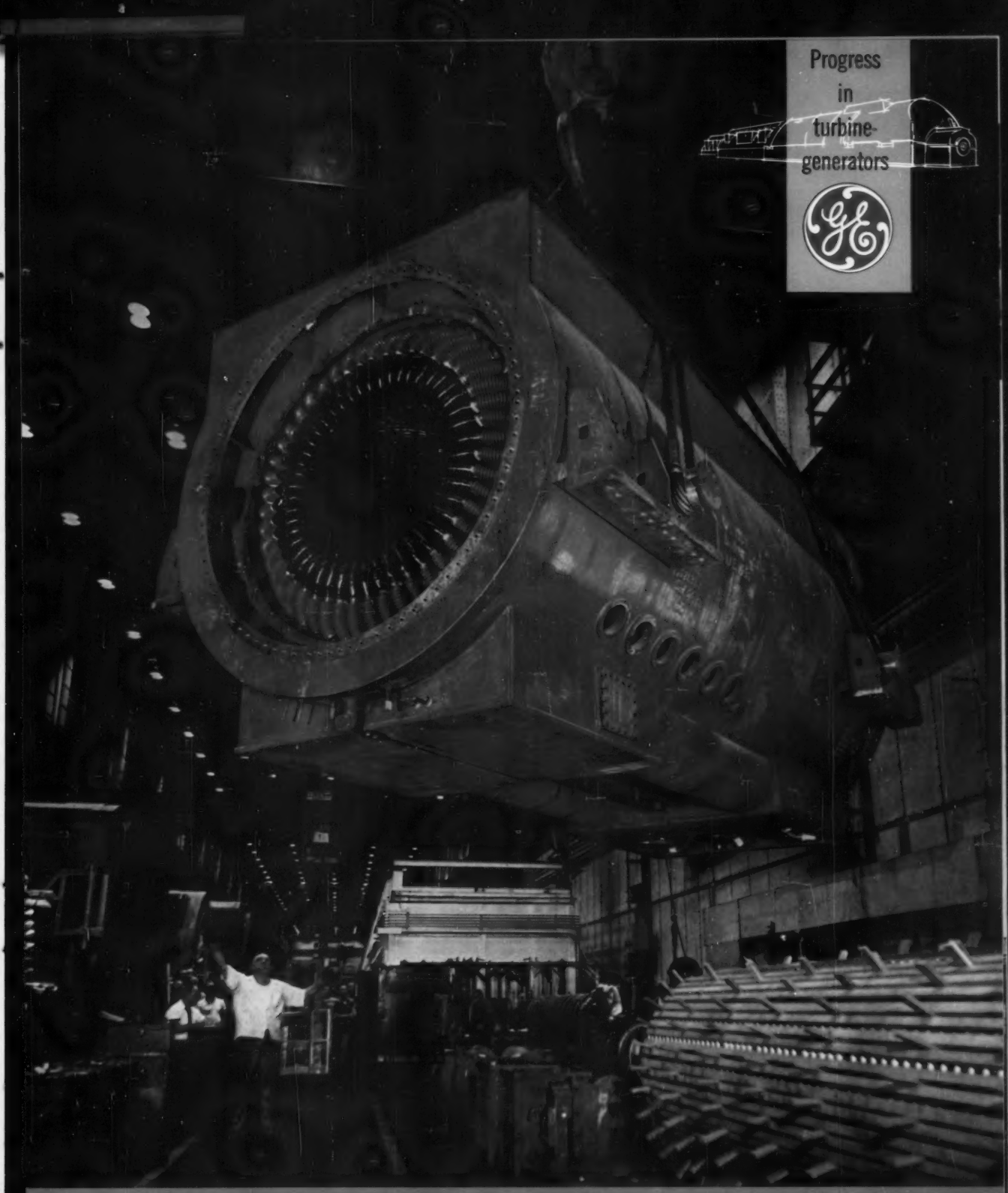
2. Until recently lack of adequate water conditioning retarded developments of the once-through boiler.

3. Operating at high temperatures is a problem in itself. Increased plant efficiency in the immediate future will probably come through use of higher pressures rather than higher temperatures because of the metallurgical problems associated with higher temperatures.

4. Steam conditions for supercritical-pressure plants will probably settle around 3,500 psi, 1,050F. Initial demonstration installations use higher temperatures and pressures to gain experience.

5. Control of supercritical pressure plants will differ from that of a conventional pressure plant chiefly because of the once-through boiler but will not necessarily be more difficult.

6. There is no reason to believe that a supercritical plant cannot handle rapid load swings.



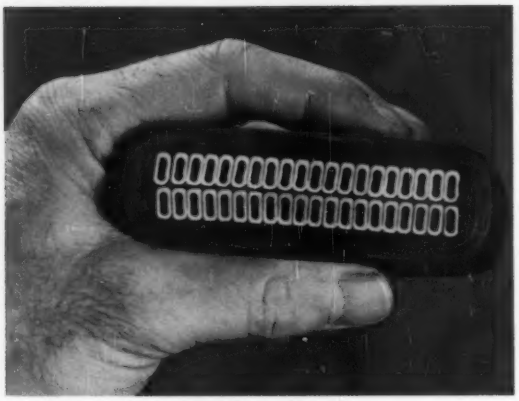
World's first large generator with liquid-cooled armature windings goes to Eastlake

New General Electric cooling system

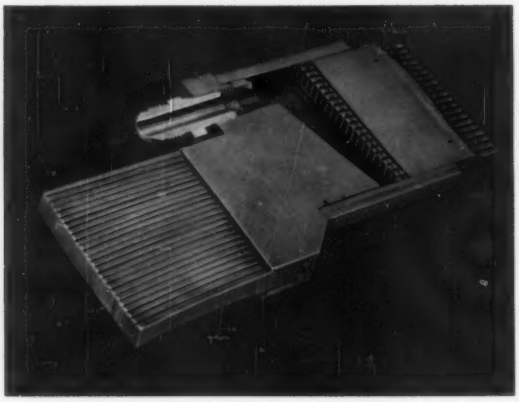
...without appreciable

This evolutionary new 260,000-kva generator incorporates one of the most significant advances in generator cooling since General Electric pioneered hydrogen cooling in 1937. Now in operation at the Cleveland Electric Illuminating Company's Eastlake Plant, it is the world's first large generator with liquid-cooled armature windings. The liquid circulates right through the conductors.

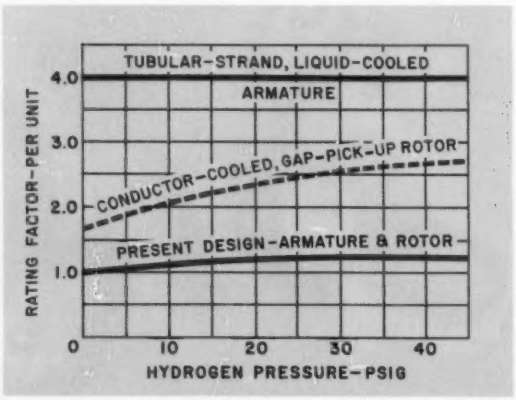
THIS DESIGN IS THE MOST EFFECTIVE method of cooling yet developed. Combined with the new conductor-cooled, gap pick-up type rotor, a typical unit's rating may be doubled without appreciable increase in physical size.



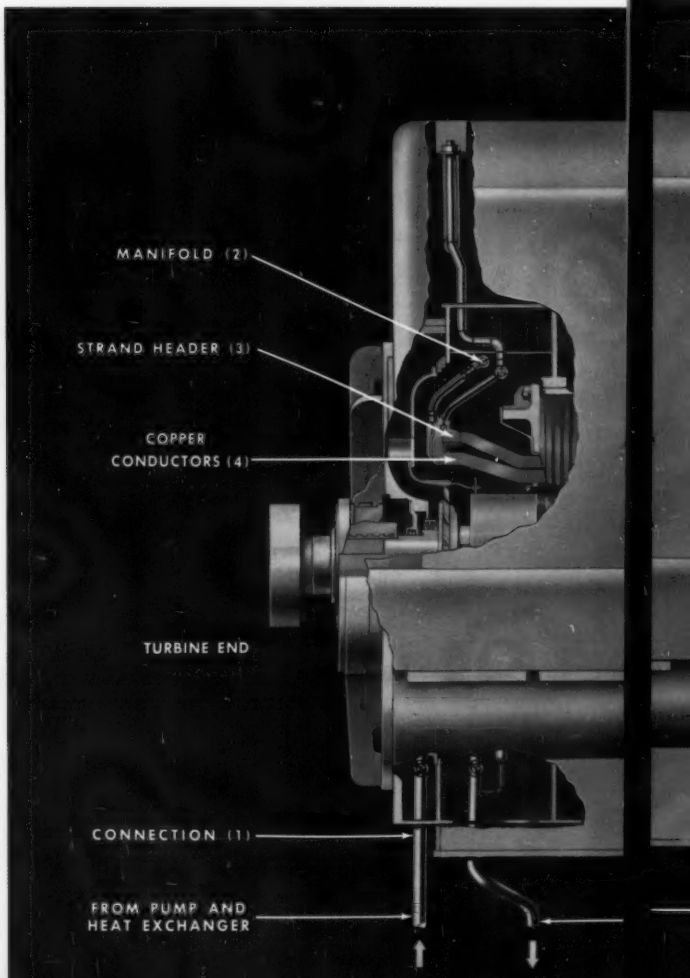
CROSS-SECTION OF ARMATURE BAR shows hollow tubular conductors which carry liquid coolant as well as current. Maximum heat removal is possible because of direct contact between cooling liquid and conductors.



COOLING LIQUID enters tubular conductors through strand header at end of armature bars. Cut-open section above shows how conductors are brazed to header.



HIGHER CAPACITIES are possible with new G-E conductor cooling development. Bringing liquid coolant in direct contact with the armature conductors can remove as much as sixteen times the heat that could be removed from them through the normal ground insulation with the same copper temperature.



can double generator rating

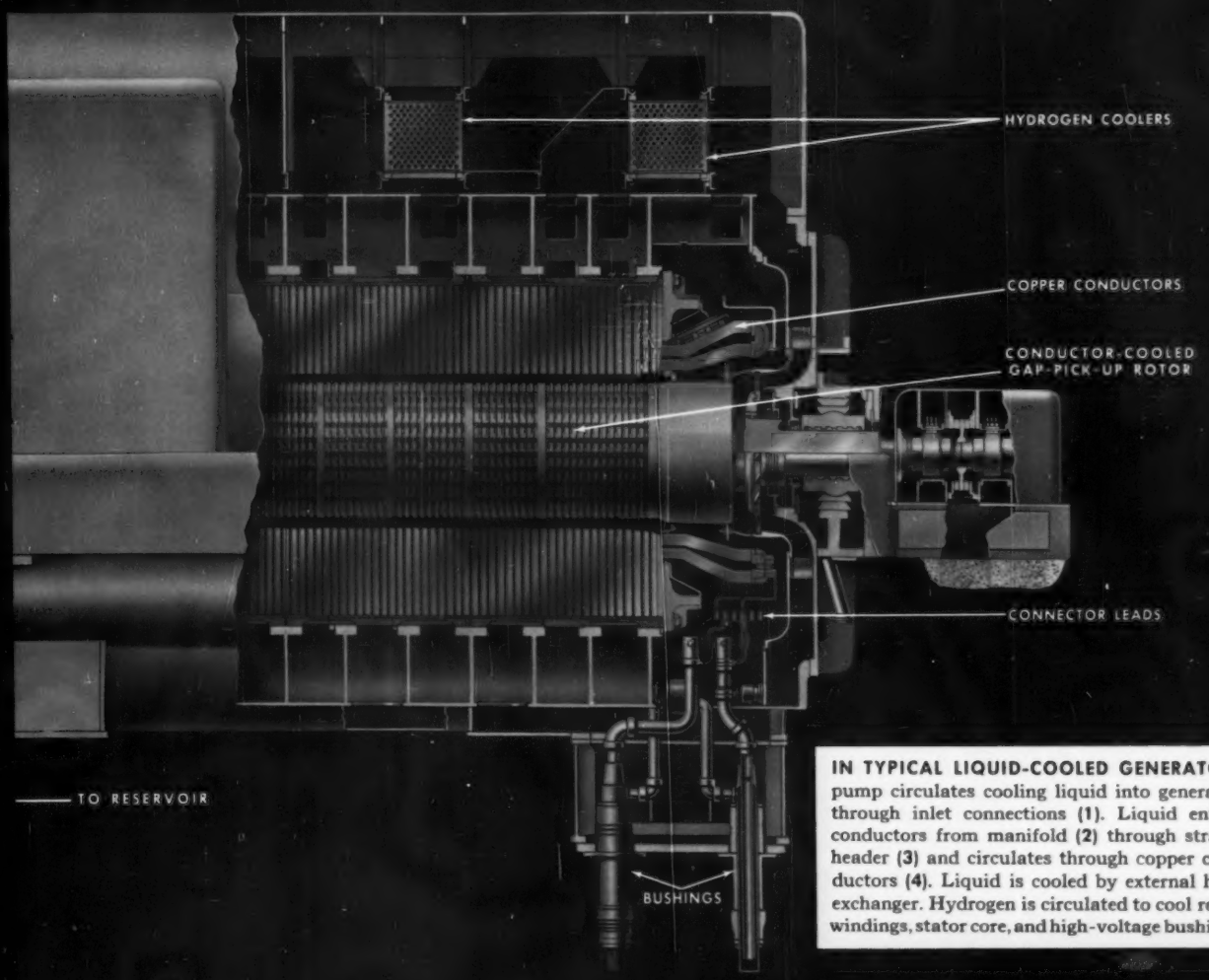
increase in physical size

Even with the increased current output made possible by liquid cooling, efficiency of this General Electric unit remains high. Design features such as: extra transposition of end windings; copper shields on the stator core clamping flanges; and machine dimensions specially designed to reduce windage losses, all contribute to this high efficiency.

The coolant circulates in a double wall guarded circuit within the armature frame. A special brazed header provides permanent joining of tubular armature conductor strands. Both the liquid and the parts enclosing the coolant are carefully selected for noncorrosive characteristics.

This 260,000-kva, 30 PSIG Eastlake generator is the largest so rated 3600-rpm generator in the world. The new design developed for Eastlake is a significant step toward doubling generator ratings without appreciable increase in frame size and points the way to much larger machines—as high as 500,000-kva. For more information write for GER-1231, "Liquid Cooling of Turbine-Generator Armature Windings," Large Steam Turbine-Generator Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC



IN TYPICAL LIQUID-COOLED GENERATOR: pump circulates cooling liquid into generator through inlet connections (1). Liquid enters conductors from manifold (2) through strand header (3) and circulates through copper conductors (4). Liquid is cooled by external heat exchanger. Hydrogen is circulated to cool rotor windings, stator core, and high-voltage bushings.

New generator produces 66% more power in same turbine room space

Eastlake's new General Electric conductor-cooled 260,000-kva generator (above) represents another milestone in turbine-generator progress. The new generator has increased station capacity 56% yet occupies the same turbine room space as each of the three other conventionally cooled, 156,250-kva General Electric units in this modern plant.

Obtaining more kilowatts in the same turbine room space is one of the many challenges created by the increasing expansion of electric utility loads. The Eastlake installation demonstrates how this challenge can be solved by advanced designs.

It is a typical example of how the electric utility industry and equipment manufacturers are cooperating to meet tomorrow's demand for larger blocks of power with turbine-generators of even higher ratings.

This latest expansion of the Eastlake plant is a further step in Cleveland Electric Illuminating Company's program of helping its customers to Live Better ... Electrically. 254-45

LIVE BETTER ELECTRICALLY

Progress Is Our Most Important Product

GENERAL ELECTRIC

Portable Diesel Set Supports Rural System

GENERATION—Operation

A trailer-mounted 300-kw, diesel-electric set generates enough power to reinforce Valley Rural Electric Co-op's main lines, which were approaching overloaded conditions as new customers arrived and the old ones increased their consumption.

This alternate source generates power at 2,400 v delta which is boosted to 12,470/7,200 wye by transformers. Thus the co-op has a unit with three voltages available.

As the terrain made loop circuits impracticable in much of the area, an alternate power source remained the only solution to the co-op's difficulty. This source had to be portable, so that it could be used at different locations in the wide area in which system improvements were required. Portable power is also very useful in emergencies.

Valley Rural with headquarters at Huntingdon, operates in south-central Pennsylvania, its lines running from 13 substations up the valleys to its rural member customers. The original 200 miles of line built in 1939 were expanded to cover 1,300 miles.

When the generator is used for single-phase operation, the phase sampled by the voltage regulator (single leg to neutral) is used. When more power is needed than can be developed by one phase, the unit is moved to a central location on the line, and two phases are used. One phase is fed one way and the other in the other direction after the line has been parted near its load midpoint.

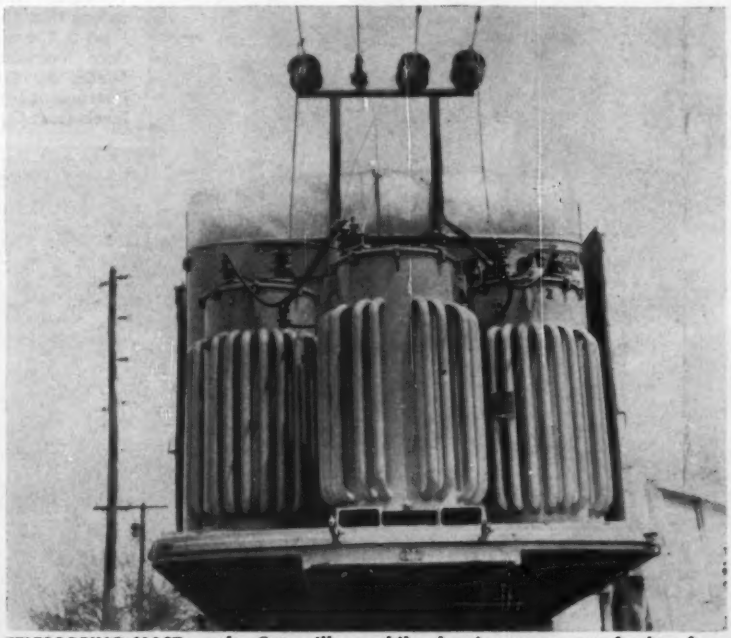
Components of the diesel power set are: Engine, V-12 mechanically supercharged 450 hp (continuous) at 1,200 rpm; generator, 300 kw, 1,200 rpm, 375 kva, 3-phase, 60 cps, 2,400 v, two-bearing with direct-connected exciter; switchboard; trailer; starting air compressor, driven by a gasoline engine; and air tanks.

The complete unit weighs 43,750 lb with water, lube oil, and 275 gal of fuel in the tank. This weight is so distributed that the unit can operate over the highways without special permits when it is hauled by a single-axle highway trailer.

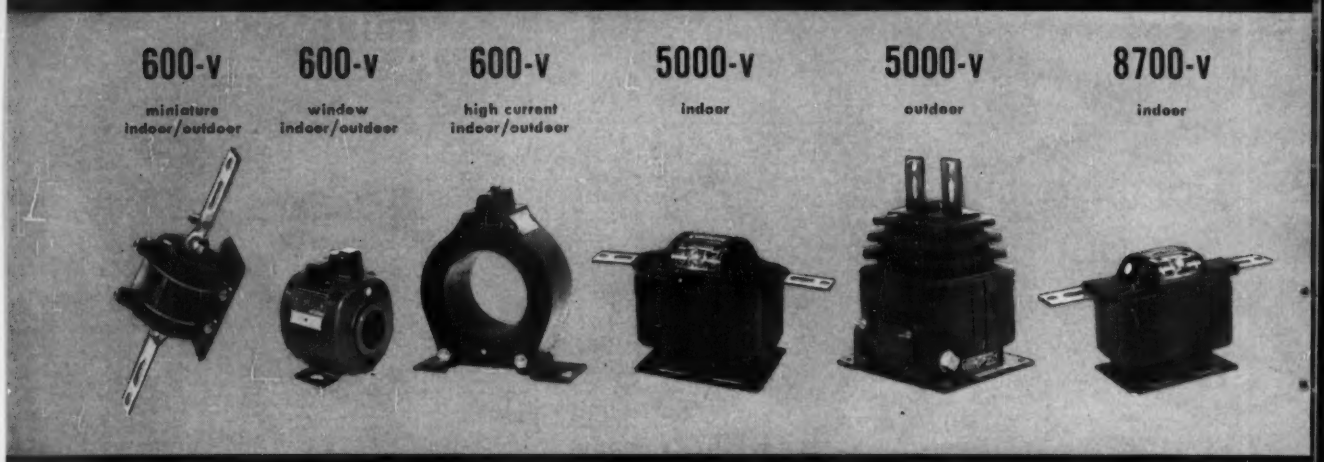
Valley rural estimates that the cost of system improvements will be reduced 20% through the use of this portable power arrangement. When the unit is not in use on the system, it may be made available for rental throughout the state and in adjoining states for any electric power application.

(*More How To on page* 132)

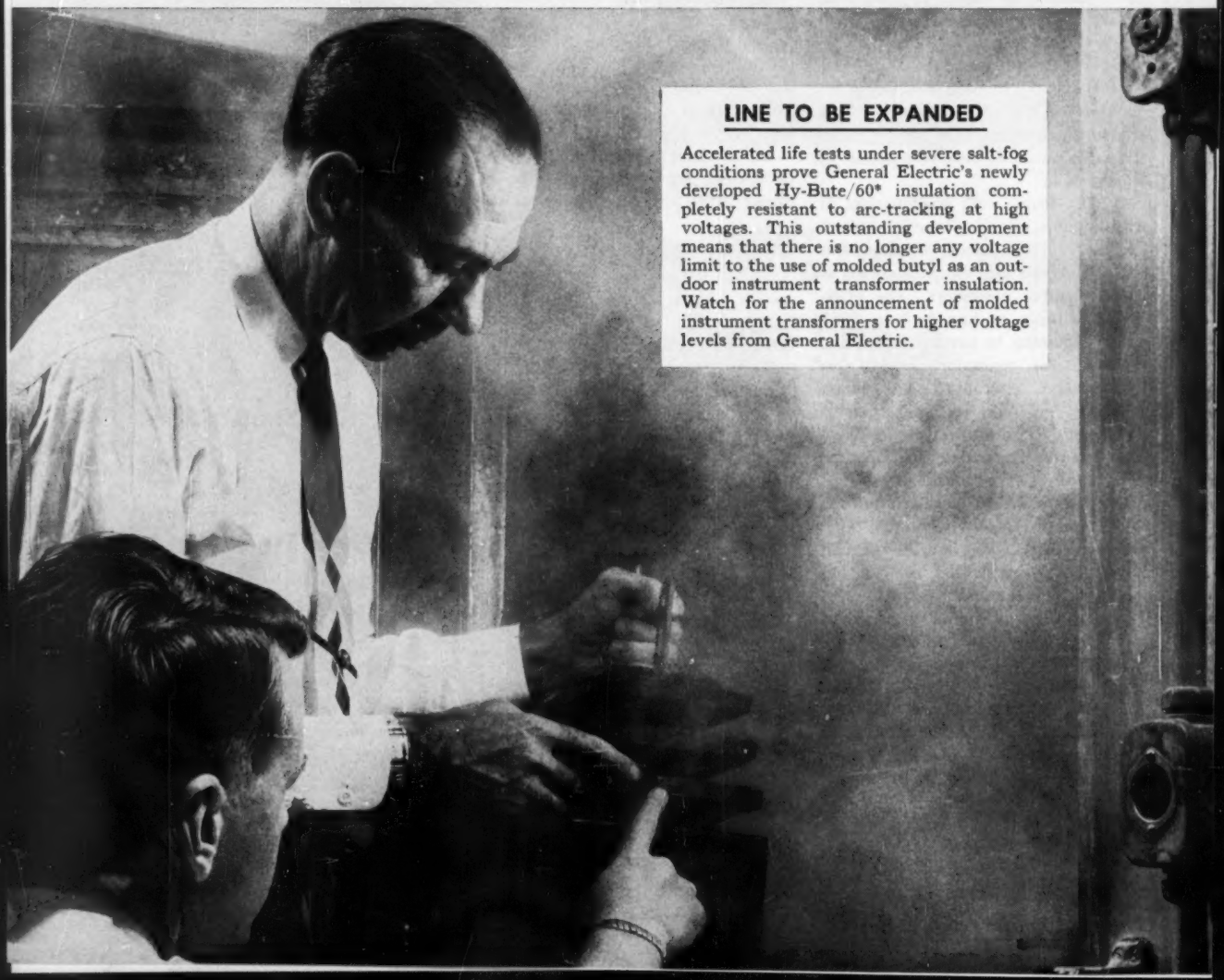
PORTABLE CATERPILLAR D397 generator set on a system location is feeding power to highline for Valley Rural Co-op member consumers near Huntington, Pa.



TELESCOPING MAST on the Caterpillar mobile electric set supports feeders from three single-phase transformers to the highline at a Valley Rural location



NOW You Get Benefits of Butyl- General Electric



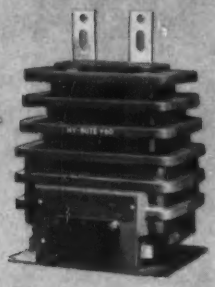
LINE TO BE EXPANDED

Accelerated life tests under severe salt-fog conditions prove General Electric's newly developed Hy-Bute/60* insulation completely resistant to arc-tracking at high voltages. This outstanding development means that there is no longer any voltage limit to the use of molded butyl as an outdoor instrument transformer insulation. Watch for the announcement of molded instrument transformers for higher voltage levels from General Electric.

8700-v
outdoor

15000-v
indoor

15000-v
outdoor



COMPARISON CHART

G-E	X	X	X	X	X	X	X	X	X
MFR-A	X			X					
MFR-B		X	X						

Now General Electric offers molded instrument transformers in a complete line from 600 volts through 15,000 volts.

Molded Construction in all these Instrument Transformers

New 8700-volt indoor and new 8700-volt outdoor current transformers make line complete from 600-v through 15-kv

Molded in Butyl or new Hy-Bute/60* insulation, these nine General Electric instrument transformers give you many cost-saving benefits.

Maintenance is sharply reduced because butyl is corrosion resistant. There are no metal tanks to rust out—no painting is ever required no matter how corrosive the atmosphere. Porcelain bushings, which can break during installation or operation, have been completely eliminated and continuous thermal ratings of 150% to 200% on many models minimize the need for replacing transformers with higher ratings as loads increase.

Stock needs are reduced because many of the new butyl designs replace several older types. The 600-volt butyl types provide greater application flexibility because they can be used either indoors or outdoors. You save money too, since each new butyl-molded design is priced the same as the least expensive of the older models it replaces.

Easier Installation results from the smaller size and lighter weight of butyl-molded transformers. In addition, they can be mounted in any position.

Safer and more reliable operation is assured because flame-resistant butyl will not support fire. Design features such as increased creepage distance add to the dependability of this complete family of molded instrument transformers.

Only General Electric brings you all the advantages of butyl-molded construction in a complete line of indoor and outdoor current transformers from 600-v through 15-kv. For details, call your General Electric Apparatus Sales Representative or request bulletin number GED-3112 from Section 581-3, General Electric Company, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

* Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

***ONLY* ON THE GENERAL ELECTRIC *I*-55 METER:**

$4.77 CAN BE

Tests, service prove General Electric I-55 meters can save you money

GREATER SUSTAINED ACCURACY

New test data on meter performance, compiled in G-E research laboratories, prove that General Electric's revolutionary "floating disc" meter provides high sustained accuracy which saves you money.

During accelerated life tests, identical loads were applied to the G-E I-55 meter and to meters with conventional bearing systems. The results are startling.

Here's the proof. Assume an average

GREATLY REDUCED TILT ERROR LOSSES

Any meter operating at even a slight tilt will give inaccurate readings that often result in loss of revenue. General Electric lab tests prove that I-55 meters with magnetic suspension "floating discs" are least affected by tilt—while the accuracy of meters with conventional ball bearing systems varies considerably with different angles of tilt.

Here's the proof. A conventional meter at one degree forward tilt, operating at a continuous average of 240 volts, 1.5 amperes, would lose .01728 kwhrs

NO PERIODIC BEARING REPLACEMENT

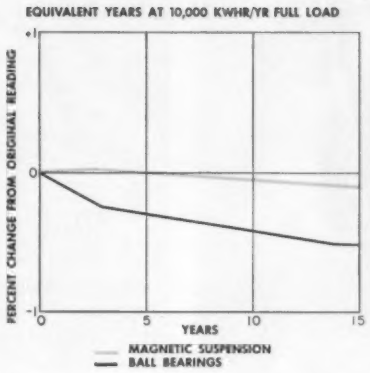
For complete details on how I-55 meters can save you money, call your nearby G-E Apparatus Sales Office. For information on the complete line of General Electric watthour meters, write Section 621-10, General Electric Co., Schenectady 5, N. Y.

TOTAL FIFTEEN-YEAR

GENERAL ELECTRIC

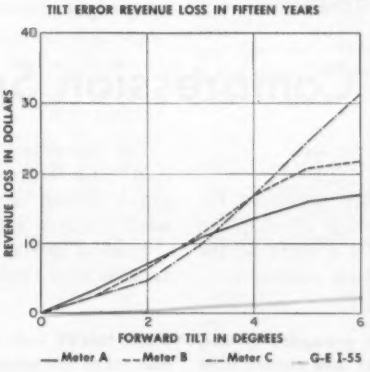
SAVED IN JUST 15 YEARS

kwhr usage per consumer (based on *Electrical World* forecasts) per year for fifteen years and the per cent loss on registration per year—the total loss in kwhrs would be 266.8 for a conventional meter. At two cents per kwhr, this means a gross loss of $5.34. By considering the "present worth" factor at 6 per cent interest for each year, the net loss on a conventional meter would be $3.14. The I-55 eliminates this loss and saves you the money.



$3.14

registration over the I-55 in 24 hours. In 15 years, the kwhr loss would be an amazing 94.40 kwhrs. Taking a reasonable figure of two cents per kwhr, the gross loss would be $1.89. By considering the "present worth" factor at 6 per cent interest for each of the fifteen years, the conservative saving realized by using a General Electric I-55 meter would be $1.29. And a glance at the chart on the right reveals much higher savings at tilt errors of 2 degrees to 6 degrees.



1.29

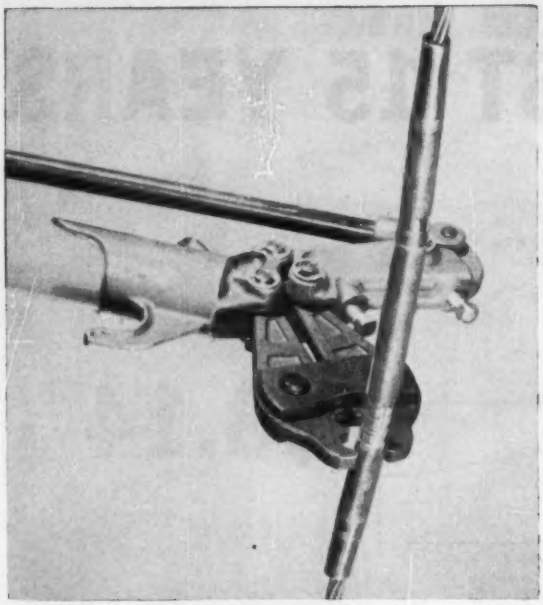
The trouble and expense of periodic bearing replacement is eliminated when you use General Electric I-55 meters with the "floating disc."

General Electric accelerated life tests prove that ball bearings in ordinary meters must be inspected and in many cases replaced after a comparatively short period of time. The G-E I-55 meter with magnetic suspension—and no bearings—showed no measurable wear even after the equivalent of more than 300 years of normal operation.

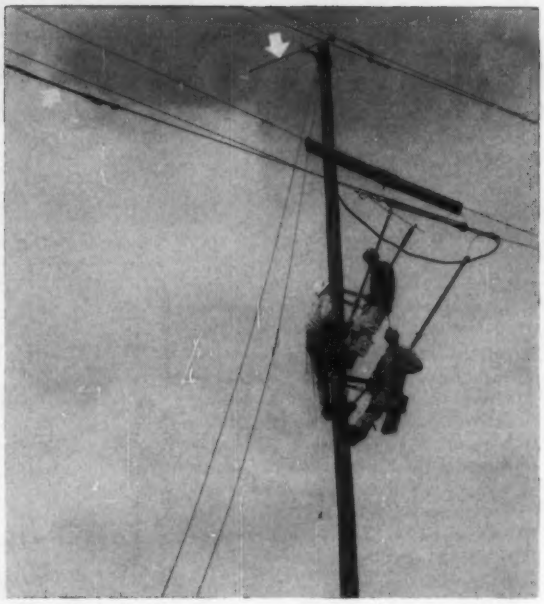
Bearing replacement is costly. Here's a typical example. Assuming replacement occurs after fifteen years' service, and taking into account an estimated average replacement cost and the "present worth" factor at 6 per cent interest, a conservative cost for bearing replacement on each conventional meter would be 34 cents. With no bearings to replace on the I-55 you save 34 cents on every meter.

.34

AVERAGE SAVING USING I-55 METER $4.77



SPECIALLY DESIGNED TOOL compresses aluminum sleeve over steel sleeve. Other special hot-line tools measure and cut the conductor. The tools speed and facilitate work



LINEMEN worked from pole at midspan. Note tong saddle at top and link stick in take-up end of rope blocks. By-pass jumper was connected at each side of splice

Apply Hot-Line Compression Splices on ACSR

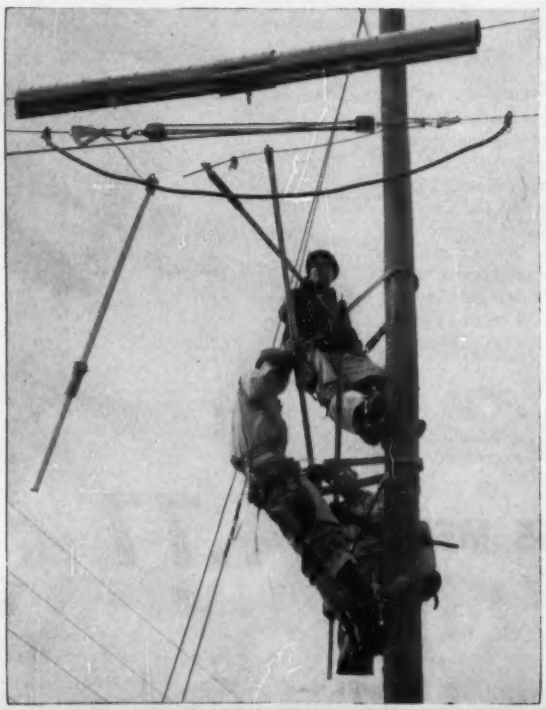
O. G. ANDERSON, A. B. Chance Co, Centralia, Mo.

Two special, insulated tools have been developed for hot-line maintenance of ACSR distribution circuits; one shears aluminum away to make room for a sleeve on the steel core, and the other compresses both sleeves.

The illustrations show how Missouri Power & Light Co used these tools on a span between a vertical deadend and a flat-top type of construction. The different pole heads required special rigging for obtaining clearance.

From a special pole at midspan by-pass jumper connections were made outside the hot-line wire grips to hold

ALUMINUM STRANDS were sheared with pre-splice cutters, leaving steel core intact. Aluminum sleeve was pushed onto conductor before the steel sleeve was installed



STEEL SLEEVE was compressed on the conductor core, linemen using the special, insulated tool for compressing. Other tools had previously measured and cut conductor

the weight of the jumper by tension in the conductor. On some such jobs, a wire tong and saddle(s) may be needed to hold the jumper clear above the phases and out of the linemen's way.

In such circumstances, a snatch block on a pole adjacent to the splicing area should be mounted high enough to support the fall line from blocks in line with the conductor. This arrangement eliminates down pull on the conductor when it is being pulled slack. An insulated link stick in the fall line between the groundman and the blocks is a wise precaution.

Missouri P&L linemen cleaned both aluminum and steel with a wire brush and a non-corrosive compound, and both steel and aluminum sleeves were given a shot of compound in the barrels before being placed on the conductor.

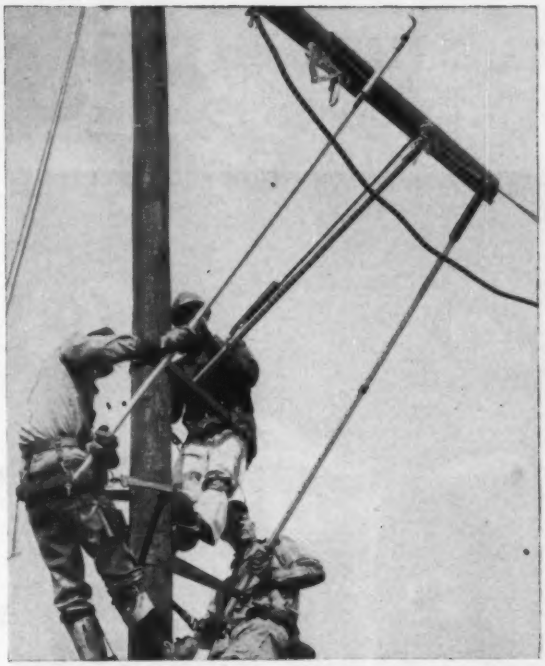
Hot-line tools measured and cut the conductor, and a hot-line clamp and hot stick for gripping the clamp placed the aluminum sleeve on the conductor. The sleeve was pushed back enough to allow shearing the aluminum strands preparatory to installing the steel sleeve. The latter was held in a hot-line gripping stick during measurement for shearing the aluminum strands.

To allow for expansion of the steel sleeve when compressed, strands were cut about ½ in. beyond measurement for the steel sleeve. The steel sleeve was installed on the steel core by placing it in the jaws of a compression tool, the weight of whose lever and handle held the sleeve firmly. It was compressed alternately at each end. Two link sticks straightened the steel splice so that the aluminum sleeve could be pushed into place.

Strands frayed in cutting were rolled back into position with a hot-line clamp used with a rolling action. The clamp was then moved back on the conductor to act as a stop for the end of the sleeve to butt against. This facilitated placing the aluminum sleeve over the steel sleeve properly.

When the aluminum sleeve was in place, the hot-line clamp was removed and the aluminum sleeve compressed.

More room for making a better splice was obtained by removing the blocks after one compression was made on each side of the aluminum sleeve.



ALUMINUM SLEEVE was compressed after it was positioned over the steel sleeve. After one compression on each side of the aluminum sleeve, the blocks could be removed

DISTRIBUTION—Operations

Give Alternate Source Voltage Drop Faster

R. J. FAIRFIELD, District Electrical Engineer,
J. F. MELTON, District Engineer, Appalachian Electric Power Co., Charleston, W. Va.

Here's a way to cut in half the time customarily required for calculating voltage drops when all or a portion of a circuit may be served from alternate power sources. It may be used in the selection of a new station site, in the transfer of a portion of one circuit to another, or in checking voltage conditions when the normal source is out of service.

Considering Fig 2, let:

L_1 = 3,000 ft W_1 = 500 kva X_1 = 1,000 ft
L_2 = 2,000 ft W_2 = 200 kva X_2 = 3,000 ft
L_3 = 4,000 ft W_3 = 300 kva X_3 = 5,000 ft
W_n = 100 kva X_n = 6,000 ft

From Source A (formal feed)

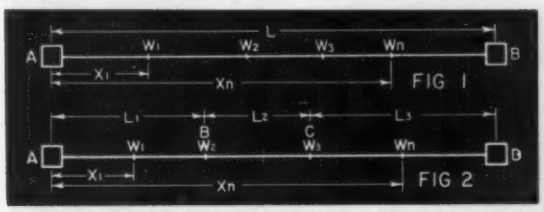


FIG 1—One size circuit between alternate sources A, B, and any number of Loads W_2.....W_n
Kva-ft (B to A) = (L x kva transferred) — kva-ft (A to B)

FIG 2—Circuit between alternate sources A, D, with different wire size in A-B, B-C, C-D
Kva-ft (D to C) = (L_2 x kva transferred) — kva-ft (C to D)
Kva-ft (C to B) = (L_2 x kva transferred) — kva-ft (B to C)
Kva-ft (B to A) = (L_1 x kva transferred) — kva-ft (A to B)

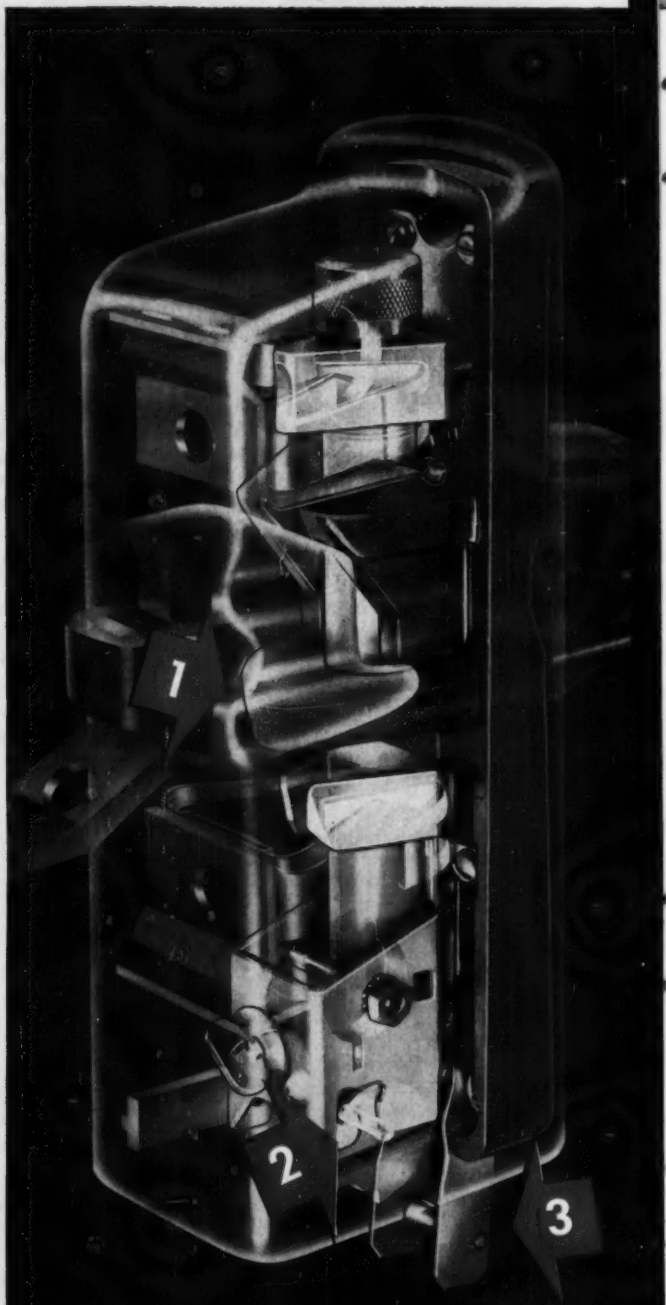
Kva-ft (A to B)
$= W_1X_1 \div (W_2 + W_3 + W_n)\, X_2$
$= 500 \times 1{,}000 + (200 + 300 + 100)\, 3{,}000$
$= 2{,}300{,}000$

(*Continued on page* 142)

old

1. Old-type barrier overlaps housing barrier retarding flow of expulsion gases—
2. Single-hinge hook made removal and replacement of door difficult.

new



1. Snug-fitting neoprene rubber barrier prevents expulsion gases from bridging cutout contacts.
2. Double-hinging of cutout door provides for accurate door closing.
3. Semaphore gives reliable indication of blown fuse—easily seen from the ground.

ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Snug-fitting neoprene barrier prevents internal flashovers

Double-hinging assures accurate door closing

Flip-out semaphore indicates blown fuse

SNUG-FITTING NEOPRENE BARRIER stops potentially dangerous expulsion gas flashovers from occurring between contacts in General Electric's all-new enclosed fuse cutout. This neoprene rubber barrier fits snugly around the fuseholder and, in conjunction with contoured porcelain of the housing, provides an effective seal.

DOUBLE-HINGING OF CUTOUT DOOR to porcelain housing provides for accurate door closing. Provides more stable support for removal and replacement of cutout door in service. Non-ferrous housing hinge pins give longer life even under severe service condition.

FLIP-OUT SEMAPHORE gives clear indication of blown fuse. This spring-actuated device at the bottom of the fuseholder aids instantaneous flip-out of the fuse link cable after the fuse blows. This is particularly important during low-current interruptions. As a semaphore, it gives reliable indication of a blown fuse because it can be easily seen from the ground—a real advantage on non-dropout units.

ALL FROM ONE SOURCE—General Electric's new Enclosed Fuse cutout line gives you a choice for every need—indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You can select from two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kv, to match every system demand.

OTHER FEATURES your lineman will like: safety-grip door handle (puts an end to switchstick juggling)—unique plastic-to-metal latching (prevents door "seizing")—extra easy fusing and line connecting for fastest possible installation and servicing.

For a complete description of the new cutout line, write for Bulletin GEA-6208, General Electric Company, Section 433-16, Schenectady 5, New York.

Accurate—Highly Dependable General Electric Fuse Links

Assure maximum effectiveness of your General Electric Fuse Cutouts with General Electric Fuse Links that feature:

Low-melting point alloy of lead and silver in fusible element . . . Specially stranded cable for maximum flexibility . . . Lowest resistivity . . . Auxiliary Fuse tubes that will not warp or shrink . . . Proper balance of strain wire and fusible wire . . . Button cap seal and solid washer to confine gases . . . Assure positive operation . . . simple replacement.

Order them from your General Electric Distributor today.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DISTRIBUTION TRANSFORMERS

THIS BOLT

COULD SAVE YOU...$3,000

Estimate your possible savings in terms of all transformers on your lines

When the neutral terminal on a 25-kva transformer broke, it put 240 volts across the 120-volt lines of several customers of a Northwestern utility. Result? Nine irate customers sued the utility for about $3000 worth of ruined household appliances.

This was an unusual situation, of course. But ordinary terminals sometimes crack, and the results can be serious. The usual villain is stress-corrosion, initiated when a lineman tightens the terminal clamp close to the metal's yield point. Corrosive elements go to work and eventually the terminal clamp breaks, dropping the line and bringing customer complaints.

G-E Strenicor terminal clamps can save you that expense. Designed to be 100% resistant to stress-corrosion, the clamps are practically immune to failure. Forged from a new copper-nickel-silicon alloy—Strenicor—G-E clamps have a tensile strength of 107,000 psi, and will resist corrosive atmospheres that cause failure in ordinary copper alloys.

Look at the other money-saving features that prove "all transformers are not alike": **Impulse testing,** for instance, saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable Nitrile rubber gaskets help save units from contamination. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-37, Schenectady 5, N. Y.

dollar-saving features prove ATANA*

***ALL TRANSFORMERS ARE NOT ALIKE**
(make this simple comparison and see)

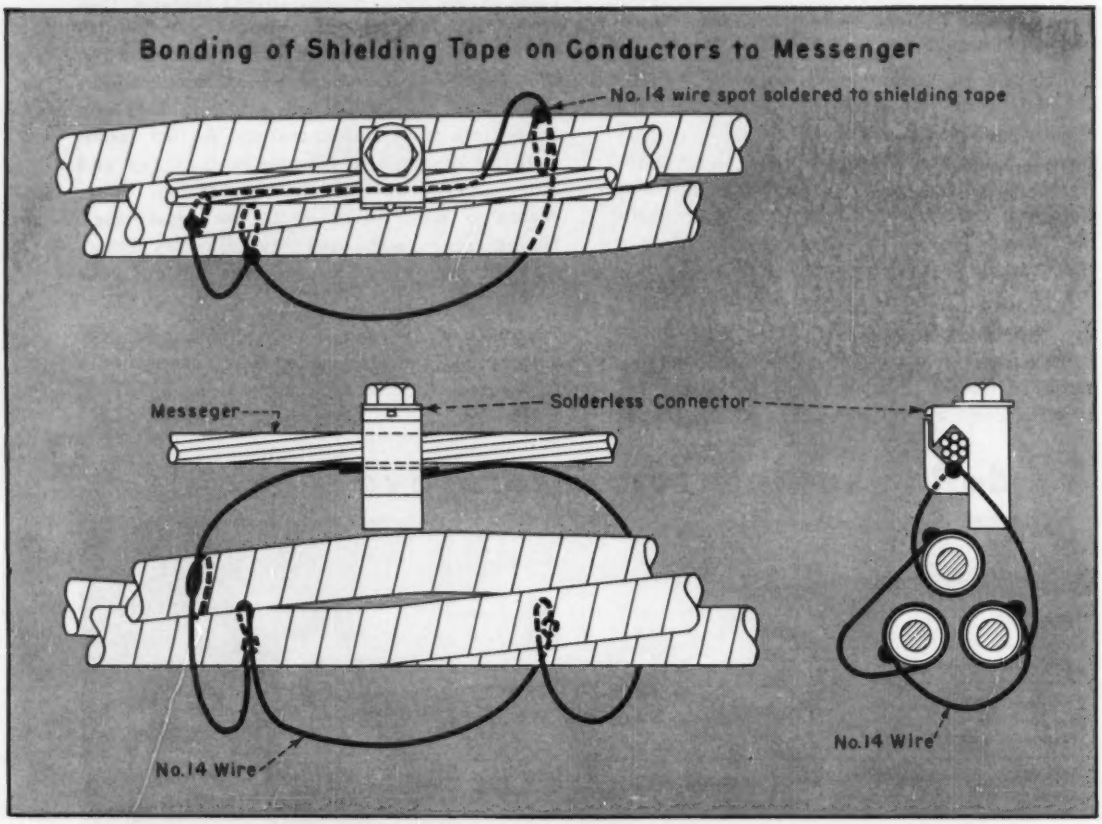
FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC

Cross Bonding of Shielding Tape on 5-Kv Preassembled Aerial Cable

A method for bonding of shielding tape on conductors to the messenger of an aerial cable. This procedure is adapted from distribution standards of New England Electric System.



Material:

No. 1/0 solderless connector for ⅜-in. messenger
No. 2/0 solderless connector for ½-in. messenger
No. 14 bare, stranded and tinned copper wire

Instructions:

Shielded cable shall be cross bonded at each end of all joints and each side of sectionalizing switches and terminations.

Procedure:

No. 14 bare, stranded and tinned copper wire is to be wrapped one turn around each conductor (over shielding tape) and spot soldered to shielding tape on each conductor at one point.

The two ends of the No. 14 wire should be connected to the messenger by using one No. 1/0 or No. 2/0 solderless connector depending on the size of messenger.

Who says you can't get better hot line clamps?

EVERYTHING you ever wanted in a hot line clamp is built into this Fargo "AGE" Series. The "vise type" design with extra wide jaws holds down joint temperatures, gives superior conductor contact, minimizes conductor cold flow.

What's more, the jaws of these "AGE" Series clamps are of identical metals to equalize thermal expansion. Large ears or lugs provide positive grip with every type of hot stick. And out of sight, but constantly on the job, is the rugged Vanadium steel spring that makes up for variables caused by fault currents, load and atmospheric changes . . . compensates for the cold flow tendencies of conductors under stress . . . offsets the varying torque linemen use in tightening connections.

Fargo Spring-Loaded Hot Line Clamps are in bronze or plated bronze, aluminum or plated aluminum . . . and in four sizes covering the wire size range from #8 to 2,000 MCM.

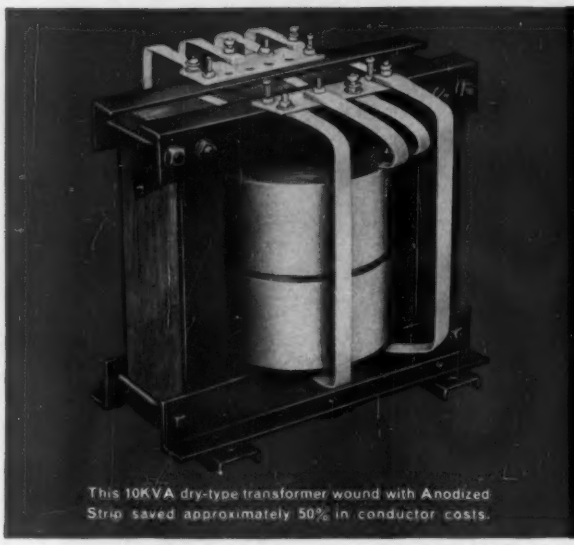
ASK YOUR LINE MATERIAL FIELD ENGINEER FOR COMPLETE DETAILS.

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

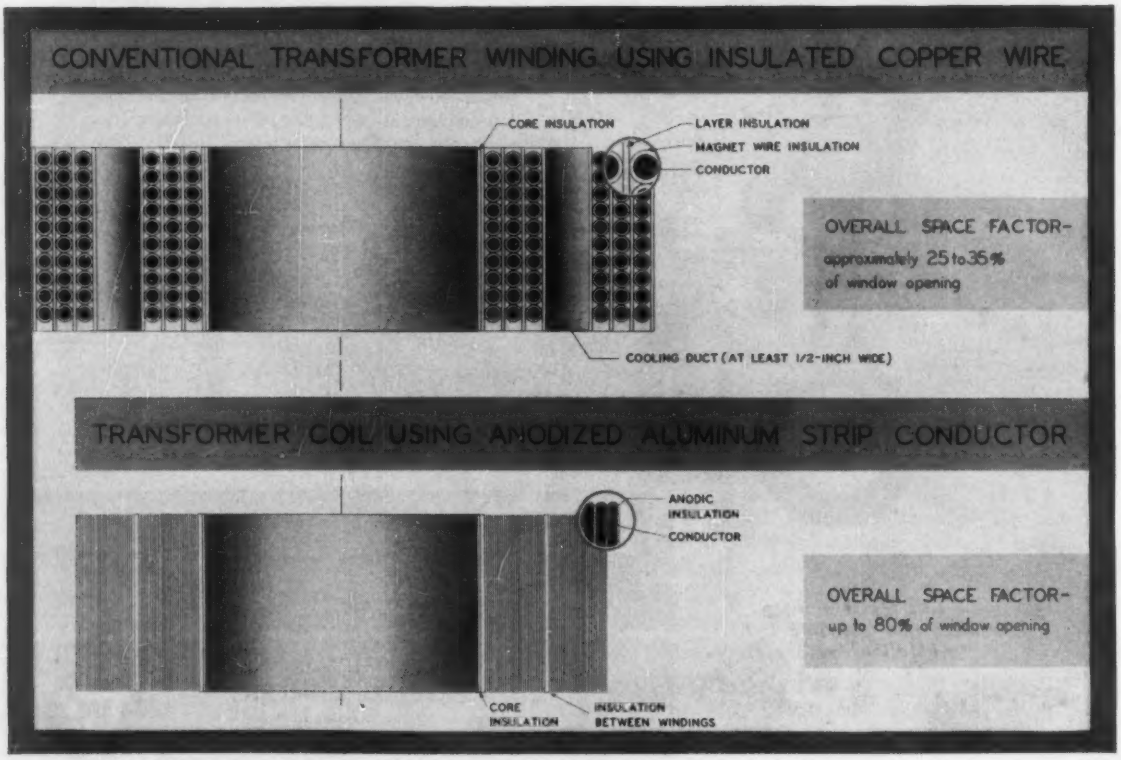
Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Now from Reynolds... TWO ALUMINUM

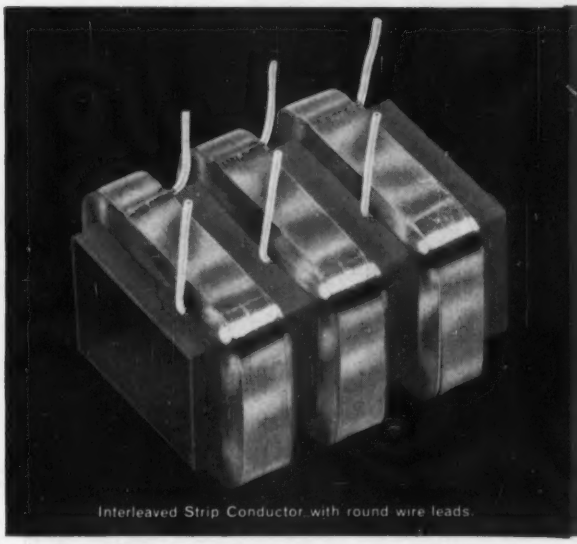


This 10KVA dry-type transformer wound with Anodized Strip saved approximately 50% in conductor costs.

Interleaved Strip Conductor with taped lead and mechanical joint wound on magnetic core.



STRIP CONDUCTORS



Interleaved Strip Conductor with round wire leads.

Anodized or Interleaved

- **Here are New Design Possibilities for Coils and Transformers**
- **Here are Savings in Material Costs up to 50%... Less Weight... Simplified Production**

Both types of Reynolds Aluminum Strip Conductor offer exceptional advantages over copper wire in the field of electromagnetic design: *Increased electrical performance* because of lower average operating temperatures and better heat dissipation. *Lower costs* because of light weight and simplified winding techniques that result in lower labor winding costs. *Better availability* because aluminum has a brighter future from a supply standpoint. In fact, many forward looking manufacturers have already converted to aluminum as a conductor, and this conversion *now*, can mean less cost, less confusion and better stability to meet future demands.

Reynolds Interleaved Strip Conductor is integrally wound with a thin layer of interleaving material that serves as the insulation. It gives compactness to coils and reduces voids and insulation thickness. There are many economical interleaving materials available and manufacturers can select those best suited to their particular requirements. There are also several different joining methods that can be used for the application of aluminum strip in winding electromagnetic coils.

Reynolds Anodized Strip Conductor is normally recommended for application in the heavier gauges .006" and up where high temperature operation is important, whereas Interleaved Conductor utilizes the lighter gauges at more conventional operating conditions. With Anodized Strip Conductor aluminum is both an efficient conductor and an effective insulator. Through anodizing, the aluminum oxide film can be deepened sufficiently for insulation in many electrical applications.

It will pay you to investigate the possibilities of Reynolds Aluminum Strip Conductors—production quantities are available now. Reynolds engineers will assist manufacturers who are considering the application of Strip Conductor to their products. For technical assistance and samples, or for copies of our new "Interleaved Strip Conductor" brochure call the Reynolds Office listed under "Aluminum" in your classified telephone directory, or write *Reynolds Metals Company, P.O. Box 1800-EL, Louisville, Kentucky.*

See "Circus Boy", Reynolds new dramatic series, Sundays, NBC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Alternate Source

(*Continued from page* 133)

Kva-ft (B to C)
$= (W_3 + W_n)\ L_2$
$= (300 + 100)\ 2{,}000$
$= 800{,}000$
Kva-ft (C to D)
$= W_n\ (X_n - X_3)$
$= 100\ (6{,}000 - 5{,}000)$
$= 100{,}000$
From Source D (alternate feed)
Kva-ft (D to C)
$= (W_1 + W_2 + W_3 + W_n)L_3 -$ Kva-ft (C to D)
$= (500 + 200 + 300 + 100)\ 4{,}000 - 100{,}000$
$= 4{,}300{,}000$
Fva-ft (C to B)
$= (W_1 + W_2 + W_3 + W_n)\ L_2 -$ Kva-ft (B to C)
$= 1{,}100 \times 2{,}000 - 800{,}000$
$= 1{,}400{,}000$
Kva-ft (B to A)
$= (W_1 + W_2 + W_3 + W_n)\ L_1 -$ Kva-ft (A to B)
$= 1{,}100 \times 3{,}000 - 2{,}300{,}000$
$= 1{,}000{,}000$

The kva-ft from the normal source must first be calculated. It can be shown then that, when a circuit or section of a circuit is transferred from one source to another, the kva-ft in any part of the circuit or section, considered from the new source, is equal to the product of the sum of all the loads transferred and the length of the part being calculated, minus the kva-ft of the same part calculated from the first source.

Formulas Cut Calculation Time

Fig 1 represents a circuit composed of the same size wire throughout its length (L), loads W_1 . . . to W_n, and alternate power sources A and B. Fig 2 represents a circuit composed of different wire sizes in sections A-B, B-C, and C-D, loads W_1 . . . to W_n, and alternate power sources A and D. The formulas with Fig 1 and 2 show the relationship between kva-ft when the source of power supply is changed from one end to the other.

The formulas can save several hours in voltage calculations for one circuit, depending on the complexity of the circuit. The kva-ft from one source must be calculated initially, and that result is inserted in the proper formula in order to obtain the value from the alternate source.

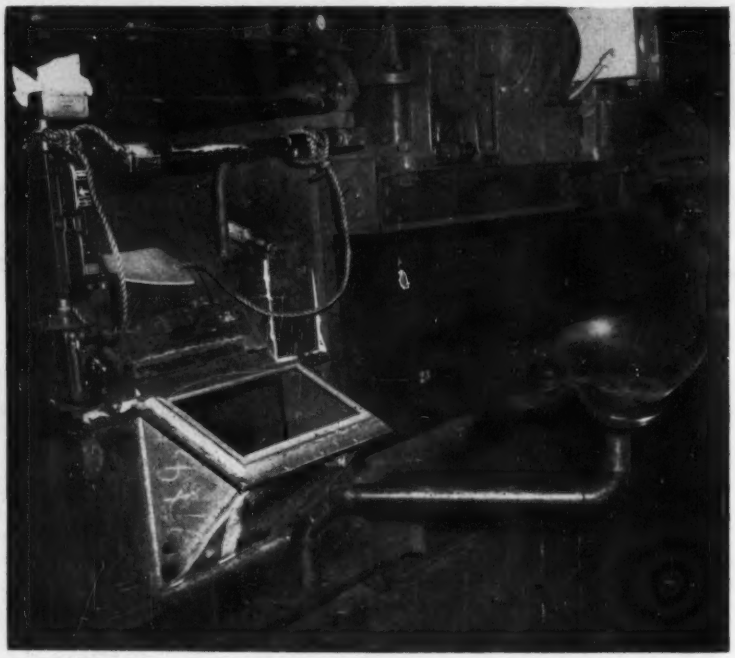
GENERATION—Operation

Revisions Aid Coal Tripper Operation

JOHN WOOTCHIE, SR, Ohio Power Co, Brilliant, Ohio

Coal trippers at the Tidd plant were originally equipped with control switches which were not convenient to the window used to ascertain the height of coal in the hoppers. Moreover, the small sight glass gave too narrow a range of vision and was frequently obscured by coal dust. Consequently hoppers were occasionally over-filled, and coal was scattered over the tripper floor by the overflow.

The tripper operator had to walk alongside the tripper as it moved across the hoppers, or he had to stand for long periods. To clean the underside of the glass he had to remove a dozen ⅜x1-in. bolts. Frequent sight-glass cleaning took many man-hours in the aggregate. When pressure of work did not afford time for dismantling the glass, it was rapped several times with a brush handle to remove the dust underneath. This expedient sometimes broke the glass.



SIMPLE REVISIONS included a larger tripper inspection window, convenient controls, and an operator's swivel seat which travels along with the coal tripper

To rectify these conditions and increase work efficiency, three simple revisions were made:

1. For a better view of hopper interiors and to avoid frequent removal of the 12 bolts, the original 6x12-in. window was replaced by a 9x18-in. pane set in an aluminum frame (like a storm window's) which can be easily lifted for cleaning the underside.

2. A tractor swivel seat was supported on a curved 2½-in. pipe which swivels in a tube welded to the tripper

(*Continued on page* 147)

One step in the miniature production of clay in the O-B Pilot Plant -- removing surplus water in a small, experimental filter press. Through the window above the operator can be seen part of the battery of production filter presses in the main clay department. It is far more than a mere figure of speech to say that research and production are only a thin partition apart.

Research and Production

only a thin partition apart!

Most manufacturers suspect they could improve their product. But, to experiment with production adds, on top of direct cost, the still higher costs of interrupted output and unfilled orders. In most cases this would be ruinous. Therefore, development drags its feet.

Think of insulators for a moment. They are one of the very few products where the manufacturer starts with the rawest of raw materials -- clay right out of the ground, converts it into a finished product in one plant, and sells it direct to the consumer. In so integrated a piece of production, large-scale experiments would produce a work stoppage. We couldn't afford it.

But we *can afford* complete duplication of our porcelain manufacture in miniature. Here, we can't obstruct production because there isn't any. Our Pilot Plant has only one product -- ideas: only one job -- to keep an eye on present quality, and to make it better!

This capsule-size factory within a factory has put a lot of improvements into the O-B insulators you use. It can afford to try new things. And *we* can afford to *let it try!*

Read the description of O-B's Pilot Plant on the next three pages. You will readily appreciate this highly practical application of Technical Competence -- the heart of every O-B insulator.

OHIO BRASS COMPANY, MANSFIELD, OHIO

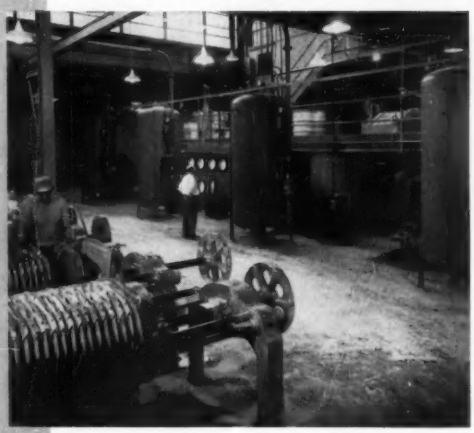
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Research and Production

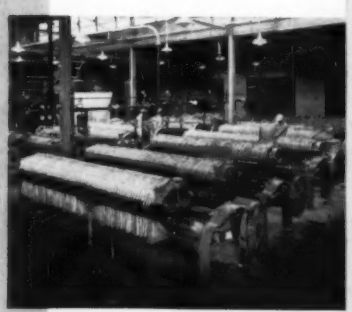
only a thin partition apart!

A few pounds of native clay are collected for the Pilot Plant, in contrast to the automatic batching equipment used for factory production. Dust, which was once a nuisance and a health hazard in batching is handled by elaborate exhausting systems. Each component of a porcelain mix, as it is drawn from its huge bins, is weighed and recorded. Lack of accuracy here would throw all subsequent production out of gear. But, the direction of this process is controlled, and its correctness is proved-out by the man who gathers a few pounds of clay for the Pilot Plant.

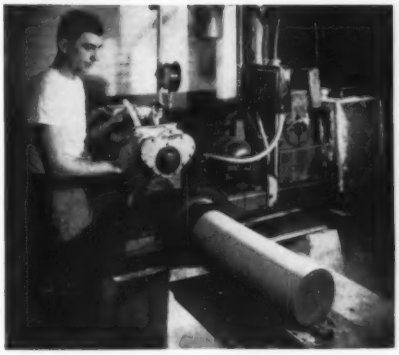


Raw clays are mixed with about equal quantities of water to make the "slip" of electrical wet ware porcelain. This thin creamy material is stirred, recirculated by pumping, and filtered in a long preparatory process. Hundreds of tons a day go through the mixers of our clay department—a few pounds a day go through the "pint size" mixer in our Pilot Plant. It is of interest to note that, behind the operator, the window opens into the main clay department of the O-B plant.

After extensive mixing and filtering, the semi-liquid slip is pumped under high pressure into a filter press which removes surplus water. Product of the filter press is a circular "press cake" of putty-like consistency -- the raw material from which insulators are formed. The laboratory model of filter press was featured on the first page. Its capacity is measured in pounds. The factory production equipment turns out hundreds of tons of insulator clay, with the industry's most modern installation.

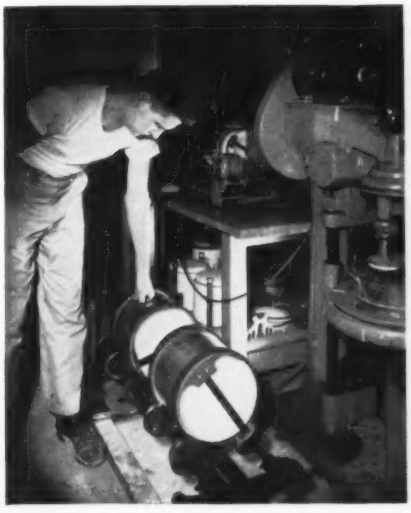


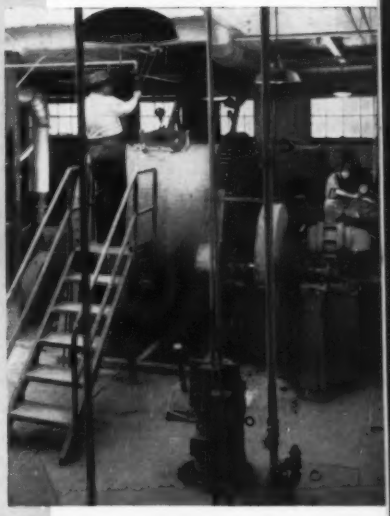
To reduce press cakes to workable shapes, and to remove all entrapped air, the pug mill shreds the clay under a high vacuum and ejects it in cylindrical form which is cut to desired length by taut steel wires. Tons of clay per hour go through the factory mills, while a few pounds are processed in the laboratory. On the small mill, various size pugs are produced; slender rods for comparative purposes and larger sizes as shown, from which actual insulators are experimentally formed.



Major portion of O-B's factory production is fired through three huge tunnel kilns of tremendous capacity. Illustrated is the burner section of one of these kilns during calibration with an optical pyrometer. To obtain complete firing flexibility for small quantities, however, the Pilot Plant uses a fully automatic experimental kiln capable of running on pre-set schedules of heat and time. In the picture a technician is checking the sag of a set of experimental test bars, since slight sag of the product is an element in attaining final shape.

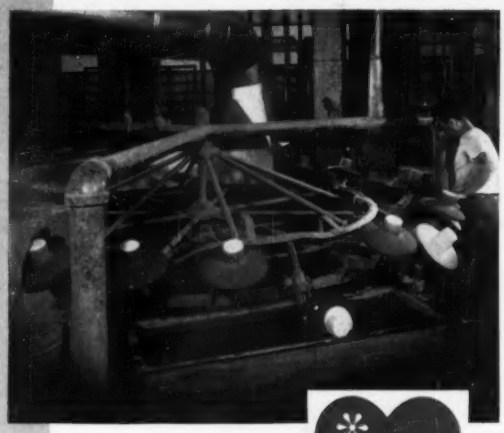
Glazing clays are reduced to extreme fineness in a ball mill. The charge of clay and water is mixed with grinding balls and rotated for a long period in a drum. Both laboratory and factory equipment do the same job, but on a somewhat different scale.





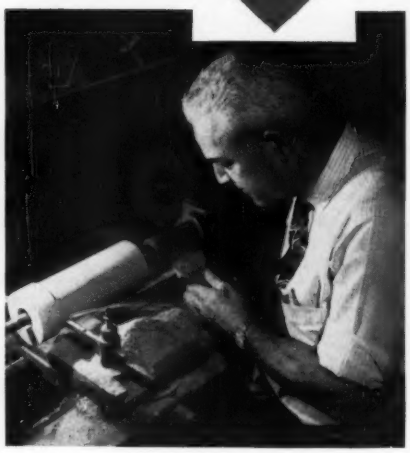
Research and Production

only a thin partition apart!



Glaze adds materially to suspension insulator strength, and one element of this glaze application is exact thickness. This is obtained by automatic dipping -- a process inaugurated 18 years ago in the O-B plant. Since speed of the machine is fixed, thickness of the coating is a function of density and viscosity of the glaze bath. Experimental glazes, as well as production samples, are applied in the Pilot Plant by means of a single-spindle machine, driven to specified speed, with dipping time controlled by a stop watch. Here, variations can be tried or factory conditions can be duplicated at will.

In an air-dry condition, similar to common chalk, porcelain is often formed by turning. Tool shape, cutting angle, speed, and many other factors must be carefully worked out to avoid setting up incipient checks that will lead to cracking in the heat of the kiln. Experimental shapes are processed in the Pilot Plant to determine best factory production conditions, thus avoiding wasted time and material.



You have seen a few examples of O-B's "Factory Within A Factory" -- the Pilot Plant -- the place where they can afford to try new ideas, because ideas are their only product. This is the intermediate step between the purely technical laboratory and the practical factory. It interprets theories into materials. It constantly watches and questions the quality of factory output, and is always on the alert to discover something better. It does things in miniature and at small cost which would be impractical on a factory-wide scale. It clears the track for men's imagination and ingenuity that would otherwise be hampered by the heavy penalty of delayed production. It is the essence of technical competence -- the heart of every O-B insulator!

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

4513-H

Aid Coal Tripping

(*Continued from page* 142)

carriage in front of the window. The seat may be swung to one side when desired.

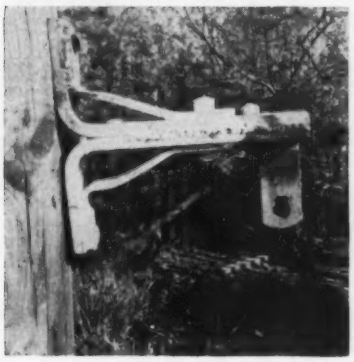
3. The tripper controls were relocated, so that they are within convenient reach of the operator on the seat at the window.

Installed in 1944

These simple changes guard against overflowing hoppers, greatly reduce time to clean the window, increase job efficiency, and eliminate continuous walking or standing.

The original tripper was furnished in 1944, and since then several improvements have been made, such as hinged inspection window and controls next to the crossover steps where the operator can stand while operating the tripper.

DISTRIBUTION—Construction



Simple Gin Aids Raising, Lowering Transformers

HARRY L. SMITH,
RICHARD E. SMITH, Ohio Power Co, East Liverpool, Ohio

A simple, detachable hoist-block bracket aids Ohio Power Co linemen in raising and lowering transformers as large as 25 kva. It eliminates the necessity of one or two men using a ½-in. rope to hold off the transformer so that the required clearance can be obtained to place the hangers. The lineman on the pole can control movement of the hoist blocks.

Made from Scrap

This bracket was made from scrap cutout or arrester hangers, and two links such as are used with pole bands.

(*Continued on page* 148)

MR. PRESIDENT:

WHAT DO YOU KNOW ABOUT RT&E?

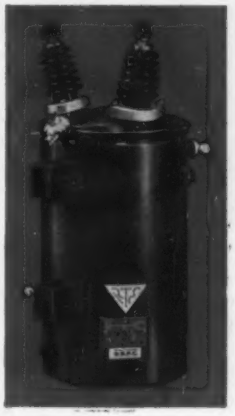
As one of America's leaders in the power industry, we think you should know something about one of America's leading suppliers of equipment to the power industry.

We said "leading" not largest. You should know that RT&E, while not big compared to the giants, is nevertheless big in service, in quality, in progress. We've packed hundreds of man years of experience into our ten years of manufacturing.

We think you'll approve our philosophy that we smaller suppliers are most important to the American economy. Sure, we'll be big some day, but in the meanwhile, we help keep the bigger boys on their toes.

For example, no other transformer manufacturer provides a 5 year guarantee or an externally operated tap changer as standard. We do.

All we want to say here is this: Remember the name RT&E. You'll hear it again.

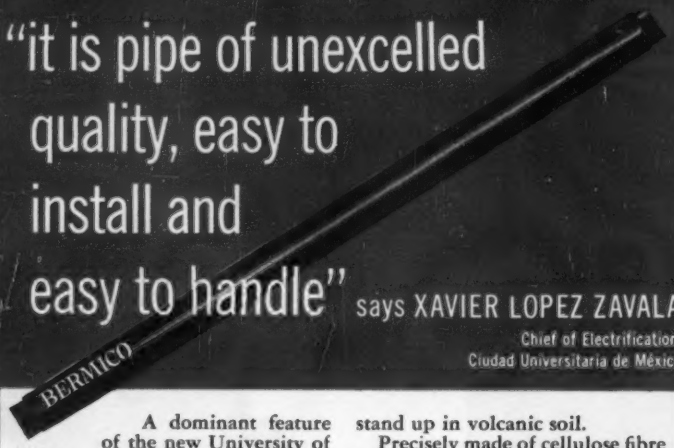


RT&E CORPORATION
WAUKESHA, WISCONSIN
Equipment to help provide power for America

BERMICO® electrical conduit was installed here because.....

"it is pipe of unexcelled quality, easy to install and easy to handle" says XAVIER LOPEZ ZAVALA

Chief of Electrification,
Ciudad Universitaria de México



A dominant feature of the new University of Mexico campus, at Mexico City, is the Library pictured above. Because the campus is built on an ancient lava bed, care had to be exercised in selection of underground materials. That Bermico conduit was used to carry the underground electrical wiring is testimony to Bermico's ability to stand up in volcanic soil.

Precisely made of cellulose fibre impregnated with coal tar pitch, Bermico Conduit is both acid- and alkali-resistant, as well as light, tight, strong, and uniform from end to end—yet low in cost.

For lasting protection of underground wiring systems specify Bermico. Immediate shipment of all sizes and fittings.

Distributed by WESTINGHOUSE Electric Supply Company

Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

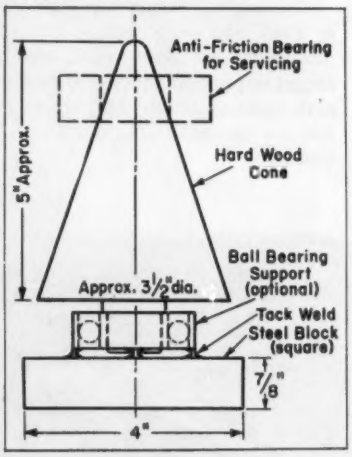
Gin Aids Lifting

(*Continued from page* 147)

It is fastened to the pole 5 in. below the gain hole by a ⅝-in. machine bolt through a hole in the upper leg of the bracket. After use, the bracket can be easily detached.

As a change in Distribution Standards has eliminated crossarms for transformer mountings, the procedure described should be modified to include boring an extra hole in the pole.

GENERATION—Maintenance



Stand Facilitates Servicing Of Anti-Friction Bearings

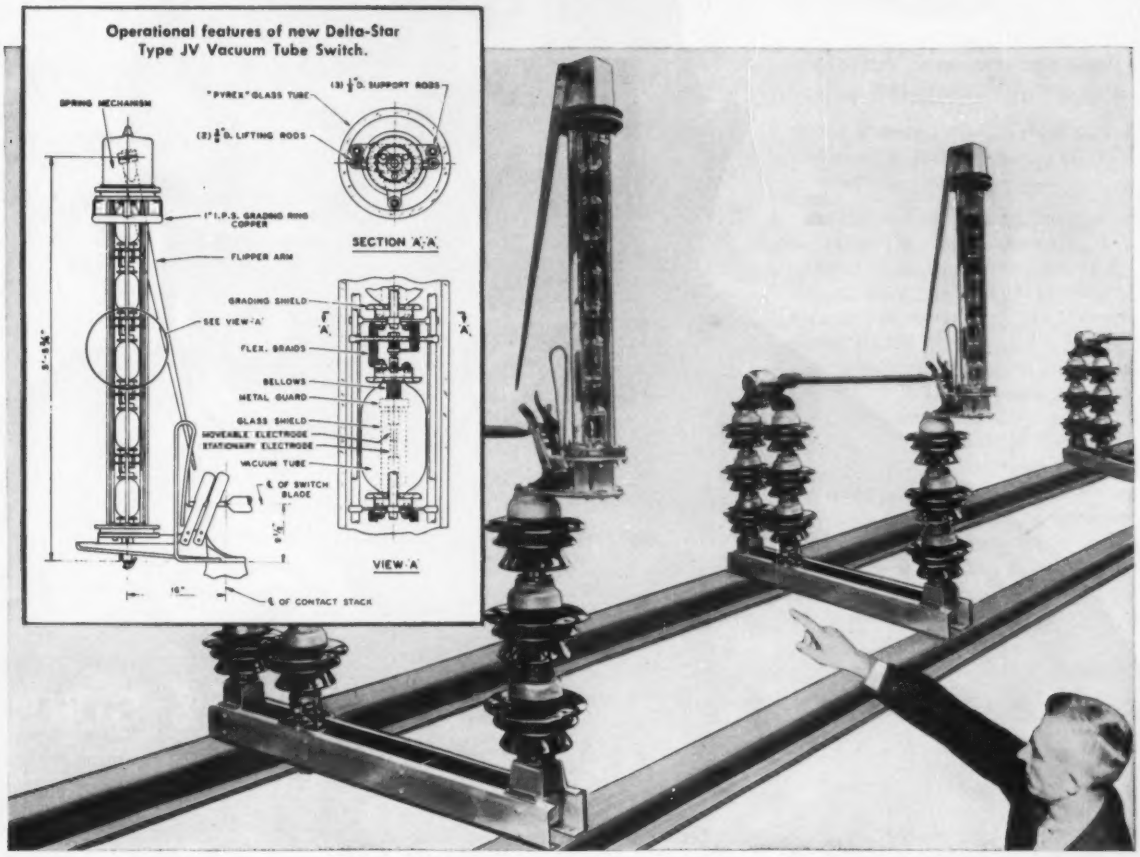
O. S. BAILEY, Kanawha Valley Power Co, Charleston, W. Va.

The simple stand illustrated prevents dirt getting into anti-friction bearings after removal from their shafts for cleaning and repacking with lubricant at hydro stations of the Kanawha Valley Power Co. Previously the bearings were often difficult to hold conveniently during this frequently recurring operation.

Bearings to be serviced may be placed on the hardwood cone and rotated for inspection and repacking without exposure to dirt or other contaminants.

This portable tool may be easily carried in a tool box. The ball-bearing support for the cone can be omitted if the convenience of rotating the inner raceway is not necessary as the outer raceway can be rotated in either case.

(*More How To on page* 151)



DELTA-STAR Announces NEW High Voltage MKV-40 Interrupter Switch

Provides positive current interruption for voltages up to 230 kv.

The new Delta-Star MKV-40 Interrupter Switch is especially well suited for switching capacitive loads. A series of vacuum switches having extremely high dielectric strength do the job. Ratings up to 230 kv have been fully tested.

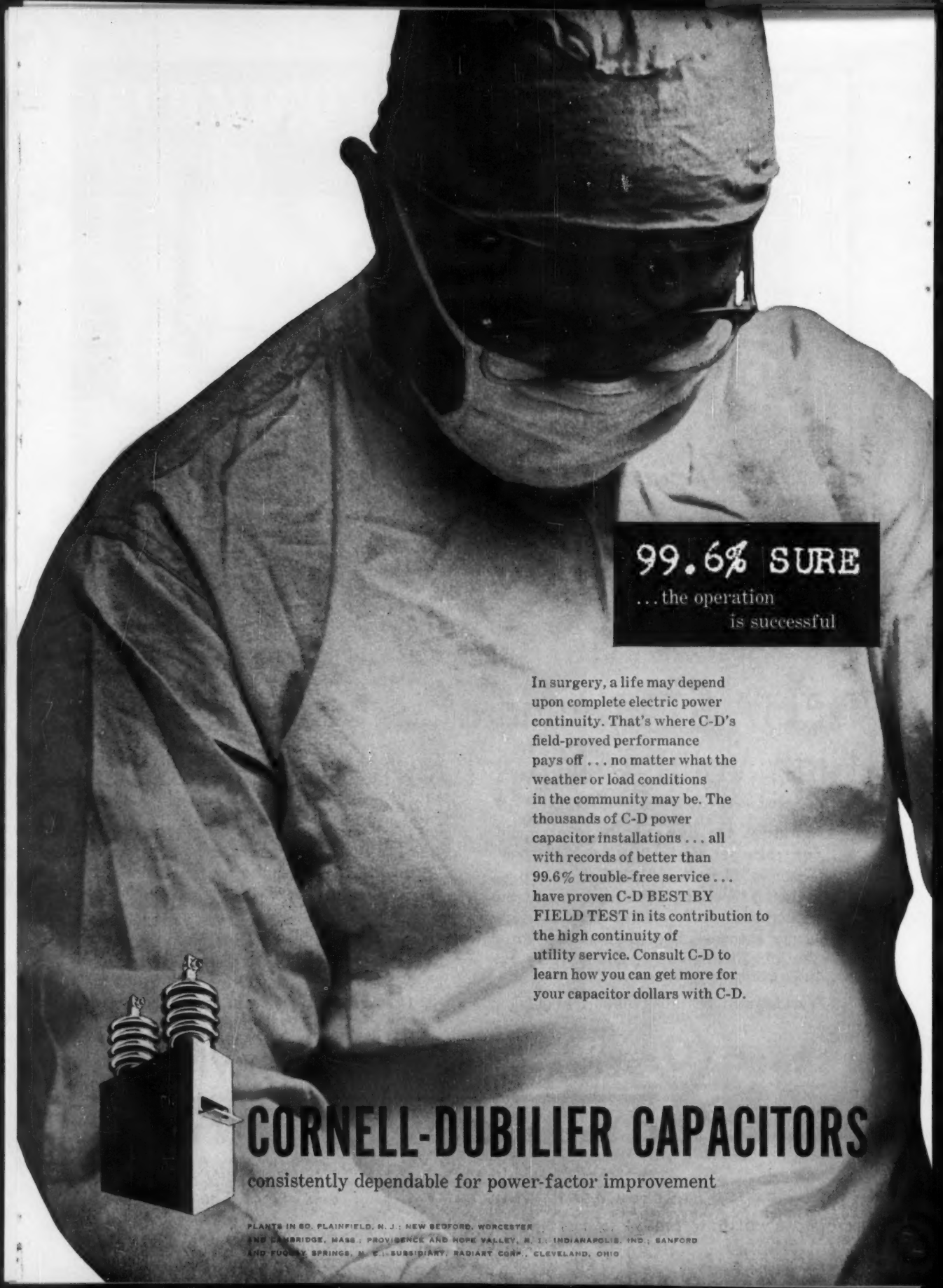
Vacuum switches are in the current only during the interrupting cycle. Interruption occurs at first current zero with no restrikes. Vacuum switches require no maintenance during the life of the switch.

Get all the facts about this new Delta-Star development from your nearest representative. Or, write Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill. Offices in principal cities.

HKP DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Alloy Metal Wire, Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Loschen Wire Rope, McLain Fire Brick, Quaker Pioneer Rubber, Quaker Rubber, Riverside Metal, Vulcan Crucible Steel, W-S Fittings.



In surgery, a life may depend upon complete electric power continuity. That's where C-D's field-proved performance pays off . . . no matter what the weather or load conditions in the community may be. The thousands of C-D power capacitor installations . . . all with records of better than 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in its contribution to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.

CORNELL-DUBILIER CAPACITORS

consistently dependable for power-factor improvement

PLANTS IN SO. PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER power-factor capacitors give you better than 99.6% trouble-free service*

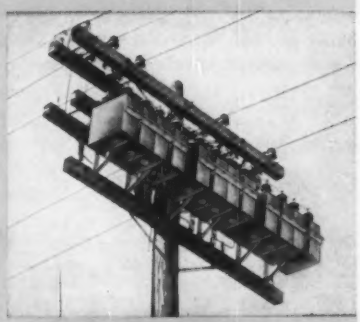
Low dielectric unit stress provides an extra margin of safety that results in the ability to withstand higher transient voltages. When you buy C-D, you buy premium quality at no extra cost.

C-D capacitors are impregnated and filled, in hermetically sealed containers with non-inflammable, non-explosive Dykanol. In addition, C-D's conservative engineering and design makes possible the use of special impregnants to fulfill even the most exacting requirements for sub-zero switching operations.

Extra strength wet process two piece porcelain terminals . . . one of the many important reasons why C-D capacitors can point to year after year of trouble-free service in coastal areas.

Another evidence of C-D's premium quality power capacitor service . . . at no extra cost . . . is the fact that C-D has *no* "Return Material Department". Most repairs are of such a minor nature that they are handled on an individual basis. This results in a prompt, personalized service impossible where the safety factor has been cut in favor of production, weight and size economies.

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



This pole-mounted C-D Capacitor installation has been on the job for an Eastern utility since 1939 with little or no maintenance.

*This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.9%.

GENERATION—Operation

Material Sealing End Bells Keeps Plasticity in Tests

ORVAL R. GREEN, Tanners Creek Station, Indiana & Michigan Electric Co, Lawrenceburg, Ind.

A light-weight sealing compound has been found that is promising as a material for sealing the end bells of hydrogen-cooled generators in tests at various temperatures at Tanners Creek station.

This material was used to fill the grooves of No. 1 low-pressure generator end bells and, in a very thin coating, on the faces of the joints. After four months' service, it has not hardened and remains plastic. Its use on the No. 3 high-pressure generator brought appreciable reduction in hydrogen loss.

Several other types of material for sealing the end bells were tried in the past and found unsatisfactory for one reason or another. Hardening with age and heat was the chief cause of failure.

GENERATION—Design

Lake Cooling Cuts Transformer Bulk

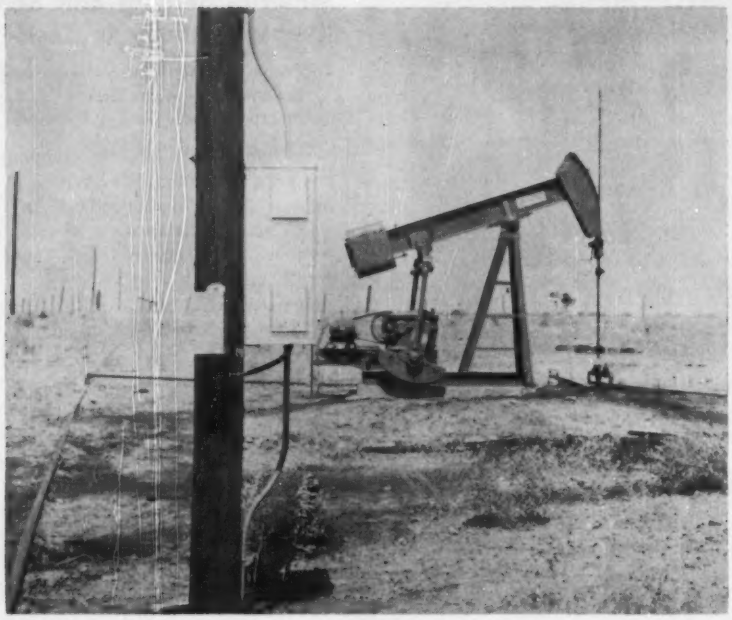
The cold, clear water of Lake Erie cools the main power transformer for the Eastlake No. 4 generating unit of Cleveland Electric Illuminating Co.

This transformer weighs 221 tons and stands 15 ft high without its bushings. Were it not for the Lake Erie water, this transformer would have had to be at least 10% larger to have the same electrical capacity, 275,000 kva.

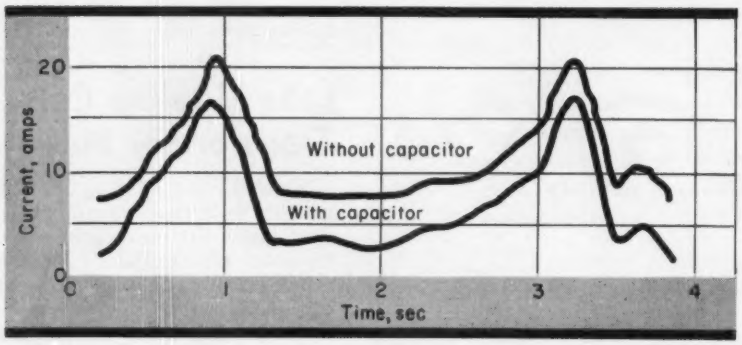
Heat dissipated by the transformer is about 1,300 kw, a tiny fraction of the electric energy put into the transformer. Its efficiency is about 99.5%.

Cooling water is pumped at the rate of 700 gpm through four tubular heat exchangers mounted on the transformer. Transformer insulating oil, warmed by the internal windings and core, gives up its heat to the water. As there is no contact between oil and water, there is no pollution of the lake. The transformer contains 9,540 gal of oil.

Most power transformers, being cooled by air, use radiators and fans.



MOTOR DRIVEN CAPACITORS on these oil field pumps improved power factor and operating conditions, reduced annual power consumption and maintenance



CURRENT DEMAND CURVES for 10-hp beam pumper, with and without 6-kvar capacitor, show reduction in lines losses and required transformer capacity

Field Characteristics

Number of wells	9	7	13	9	12
Size of wells, hp	7.5	7.5	7.5	10	10-7.5 2-10
Transformer capacity, kva	45	27	45	75	75
Capacitor cost ($12.50/kvar), $	337	70	650	450	462
V increase at farthest pump, %	7.5	4.5	11	6	6.6
Annual kwhr decrease, %	9.3	3.5	14	4	10.4
Transformer capacity released, %	56	45	94	43	53

Savings Effected, Dollars

Annual power cost (1.3¢/kwhr)	130	63	325	120	374
Transformer capacity ($17/kva)	425	204	730	544	680
Maintenance ($15/hp)	30	24	44	41	43
Capacitor cost repaid, 1st yr, %	37	50	50	27	81

Oil Well Pump Capacitors Pay Their Way

Typical leases show reduced power, maintenance costs plus better system pf

R. K. OWEN, Power Sales Engineer, Southwestern Public Service Co, Borger, Texas

In less than four years, savings in power costs alone repaid the installed cost of motor switched capacitors on Texas oil well beam pumps, according to studies made by Southwestern Public Service Co. Lower maintenance costs and a reduction in transformer capacity required yielded additional savings for the lease operators. For the utility serving the load, the installations produced a significant improvement in system power factor.

Motor Starting Torque Improves

In studying five typical leases, SPS found that capacitors raised power factors from a range of 35 to 50% to values as high as 80%. The installations boosted the voltage on all pumps on the line, thus providing a better starting characteristic for the high torque motors used in the oil fields.

Release Transformer Capacity

The additional transformer capacity released allowed operators to eliminate overloading or, in some cases, remove one transformer and operate open delta. In many cases I^2R losses alone justified the use of capacitors. One of the operators using the capacitors reported that the number of motors removed for repair dropped to about 3% annually while the repair incidence for neighboring leases without the installations remained at about 10%.

Data for the five leases studied are shown in the table on the left. The decrease in power consumption includes improvement in motor efficiency, lower line losses, and in some cases better station operation.

G & W POTHEADS

For complete cable end protection

Potheads (porcelain insulated, hermetically sealed) protect cable ends against the contaminating effects of weather, entrance of moisture and leakage of impregnating oil. Insulating compound in potheads improves the electrical strength of the creepage path on the cable insulation, increases dielectric strength by eliminating voids and serves as a secondary defense against moisture. Stress relief cones increase the strength of the cable insulation against puncture at the end of the grounded shielding.

Send for

BULLETIN No. AB56

Supersedes pages 6, 7, and 34, Bulletin AB51

Complete data on SINGLE CONDUCTOR capnut potheads for PAPER or VARNISHED CAMBRIC, LEAD COVERED CABLES and RUBBER INSULATED, NEOPRENE JACKETED CABLES. With wiping sleeve or Type "RS" (Resistoyl rubber squeeze disc) stuffing box, which hermetically seals against leakage of insulating compound and cable impregnating oil and against entrance of moisture.

G & W ELECTRIC SPECIALTY CO.
3500 W. 127th ST., BLUE ISLAND, ILL.

New address November 1956
Representatives in principal cities of U.S.A.

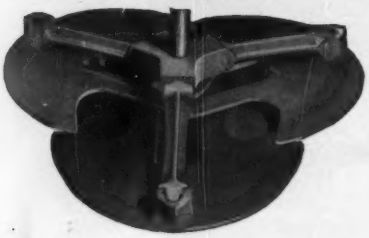
Canadian Manufacturers—
Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

A564

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA

Electric Oven Heat Treats Springs

An electric heat treating oven for stress relieving small steel automobile springs has been installed at the Cleveland Wire Spring Co, DeSoto, Mo. The springs are held at 450 to 500F for approximately 30 minutes, then removed and cooled in air. Batch time is approximately 1 hour. Advantages of the electric oven are better temperature control, cooler operation, less maintenance, and safer working conditions. Robert E. Enkelmann, Industrial Engineer, Union Electric Co, St. Louis, Mo.

INDUSTRIAL NEWS NOTES

IEC Course at Penn State

The Industrial Electrification Council's Metal Sheath Heater Course is now part of the curriculum at Penn State's Engineering Extension School. The course will be given at any of eleven sites in the state whenever the enrollment is large enough to justify it. The university added four hours of problems and examinations to the original twelve hour course to fill the regular semester requirements. A list of other US engineering schools which have extension divisions is available from the IEC. Any accredited school may now adapt the course and utilize it in their own extension program. Demonstration equipment, slides and charts are available from the Council at a very nominal cost.

•

Water Department All Electric

An 11,500-kw electric water pumping station, believed to be one of the largest in the world, is being constructed by the Kansas City, Mo, Department of Water. When the new Turkey Creek Station is placed in service early next year, the older coal-fired steam plant will be retired, leaving the city with completely electric water pumping facilities. Part of the 20-year water supply expansion program, the new unit supplements existing electric stations totalling about 13,000 kw.

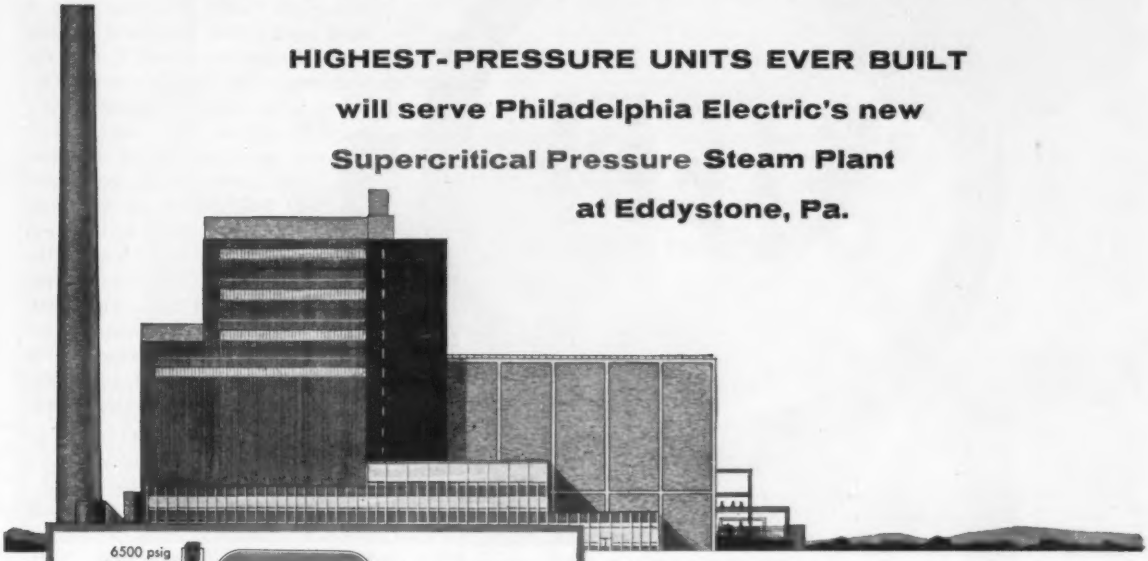
•

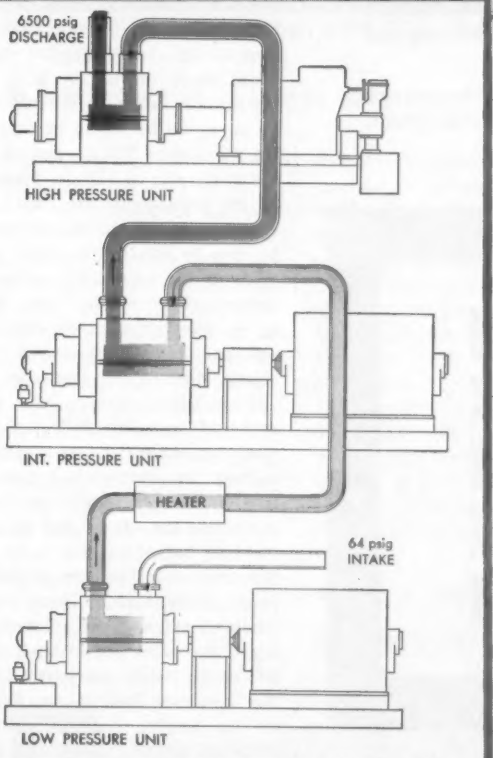
High Temperature Sintering

A new, high temperature, controlled atmosphere electric furnace for sintering and metallurgical applications was installed recently at the Powder Metals Div of Kwikset Locks, Inc., Anaheim, Cal. It will be used in the company's laboratories and be available to industry for research in high temperature brazing, heat treatment, and sintering. The furnace is a full muffle type with molybdenum resistance elements and will reach 3,100F in extremely dry hydrogen. Radiation pyrometers and saturable reactor control provide automatic, stepless temperature regulation within 5F.

6500 psig
BOILER-FEED PUMPS

HIGHEST-PRESSURE UNITS EVER BUILT
will serve Philadelphia Electric's new
Supercritical Pressure Steam Plant
at Eddystone, Pa.





Feed water at approximately 6500 psig will be provided by six CHTA pumps, operating as two half-capacity pumping units. Each pumping unit will consist of 3 pumps in series as shown above.

SCHEDULED to go on the line in 1959, Philadelphia Electric Company's 325,000 kw Eddystone Station will operate at a higher steam temperature and pressure than any installation thus far announced. Using supercritical pressure and two reheat stages, it will require less fuel per kw-hr than the most efficient power station now in operation.

The steam generator will be served by six Ingersoll-Rand double-case pumps. To provide the required pressure and capacity they will be arranged as two half-capacity pumping units each consisting of three pumps in series. The suction pressure will be 64 psig and the discharge approximately 6500 psig. The final discharge temperature is 575°F. Featuring Ingersoll-Rand's proven *Unit-Type Rotor Assembly*, these pumps will be the highest-pressure boiler feeders ever built. Special stuffing box designs will be used to control leakage at this supercritical pressure.

The selection of I-R pumps for this historic installation reflects the confidence of Philadelphia Electric Company in Ingersoll-Rand's ability to design and build equipment for pressures and temperatures never before encountered in boiler-feed service.

Whatever your boiler-feed requirements, they can be met to advantage with Ingersoll-Rand centrifugal pumps of proved dependability and economy.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.

10-465

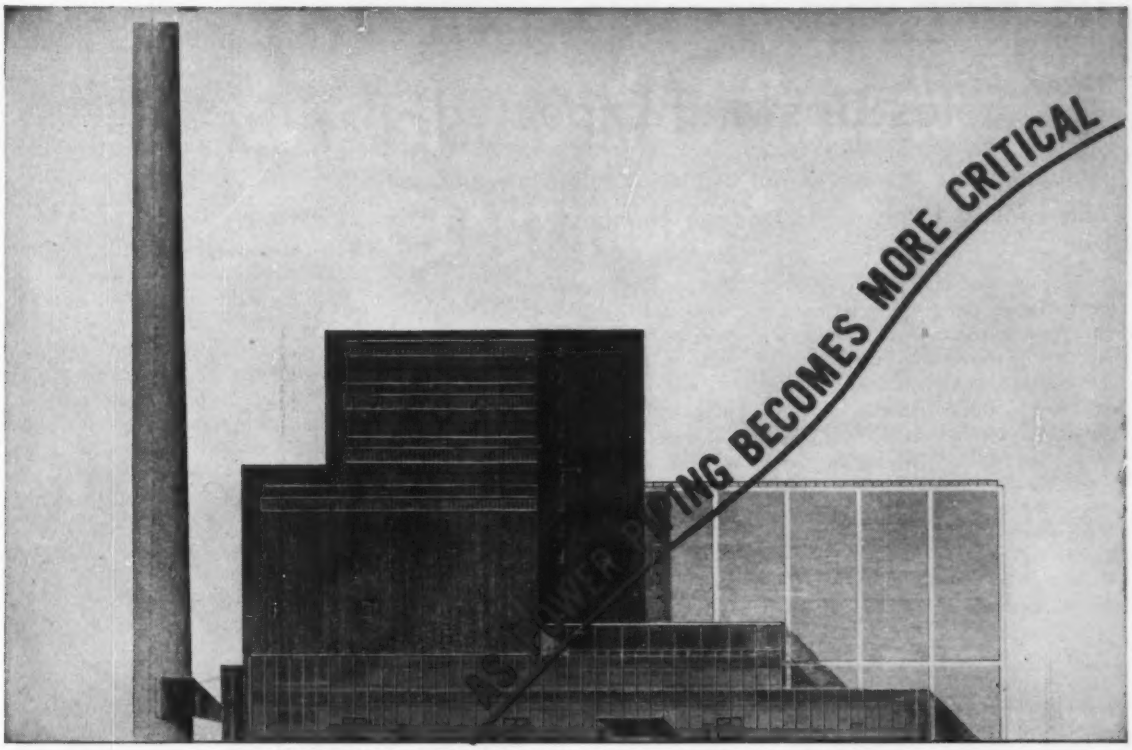
COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

FLINT
STEEL
The completely integrated facilities and personnel of Flint's two conveniently located steel plants enables Flint to provide personalized services of engineering, estimating, detailing and fabricating.
Flint invites your inquiries and requests for consultation. For information contact either plant.
FABRICATED GALVANIZED STEEL
FABRICATED STRUCTURAL STEEL
FABRICATED STEEL PLATE
FABRICATED REINFORCING STEEL
STEEL WAREHOUSE DISTRIBUTORS
CONCRETE REINFORCING STEEL INSTITUTE
CRSI
AISC
for over 40 years
FLINT STEEL CORPORATION
TULSA . . . MEMPHIS

INDUSTRIAL BRIEFS

Coal slush is piped to the Jackson Coal Company's coal cleaning plant, Hauto, Pa., at one third the cost of trucking the material. The installation, using a 125-hp motor and 8-inch pipe, carries the slush from a slush bank a half mile away directly to the cleaning machinery. Cost of the four trucks and the eight drivers required for a two-shift operation was more than three times the installation and operating cost of the pipeline. Total investment in equipment included 480/2400-v set-up transformers, a 2400-v pump at the slush bank, a half mile extension of the 2400-v line from the plant to the bank, and the pipe itself. The installation was made after a complete cost comparison based on the expected life of the slush bank. C. J. Long, Power Sales Engineer, Pennsylvania Power & Light Co., Pottsville, Pa.

Automatic mold making equipment installed at the Hay Press Co, Kansas City, Mo., has cut production costs, stepped up the production rate and taken much of the drudgery out of the foundry work. Molds as large as 19 in. by 26 in. by 16 in. and weighing more than 500 lbs can be turned out at the rate of 120 per hour. When all the refinements are added to the system, three unskilled operators will be able to handle the entire process. Without the automatic equipment, a skilled piece worker can produce about twenty-four molds, one-half this size, per hour. Time savings plus the salary differentials between skilled and unskilled workers have cut operational costs by 50%. A 100-hp muller processes the sand and feeds it into an overhead hopper. The hopper, in turn, pours the sand directly into the "drag" and the "cope," the two halves of the mold casing. When the sand has been properly prepared, a one-hp oscillating conveyor moves the casings to another station where the cores are inserted and the two casing halves are joined together. The conveyor then carries the molds to the pouring stations. Additional electrical equipment includes a 40-hp compressor and a three-hp bucket elevator. Annual energy cost is about $2,500. J. H. Tarbell, Power Sales Engineer, Kansas City Power & Light Co., Kansas City, Mo.



Architect's sketch of Philadelphia Electric Company's new Eddystone station

Kellogg's High Alloy Fabrication Keeps Pace

Designed to operate at 5000 psi at turbine throttle valve, and 1200 F., Unit No. 1 at Philadelphia Electric Company's new Eddystone station presented critical problems in the selection of an alloy for supercritical pressure piping, and in techniques for fabricating heavy-walled sections of this alloy in the shop and in the field.

More than a year ago, The M. W. Kellogg Company presented a comprehensive program to the Philadelphia Electric Company for selecting a suitable alloy, and since then has been working closely with this public utility and other prime contractors toward completion of the project. Numerous materials were studied, welded, tested, heat treated, and evaluated at Kellogg's Jersey City metallurgical laboratories. After many months of extensive and intensive work, Type 316 Stainless was selected. M. W. Kellogg has already perfected welding techniques, and is now continuing tests on this alloy and several other compositions, including strain aging for 1000 hours and 10,000 hours at 1300 F., to accumulate other data.

While this is the first time that Type 316 will have been used in power plant service for temperatures as high as 1200 F., and pressures as much as 5000 psi, it is by no means Kellogg's first experience with Type 316 or other stainless steels. For example, M. W. Kellogg recently undertook metallurgical studies and research for another large public utility prior to its selection of Type 316 for use at 1100 F. and 2400 psi. Kellogg also has done considerable fabrication of main steam lines and turbine leads, using Type 347.

The M. W. Kellogg Company welcomes the opportunity of discussing future power piping requirements with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.
A SUBSIDIARY OF PULLMAN INCORPORATED
The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

'57 Sales Upswing Expected

Manufacturers' outlook bright as they preview new heating and cooling products and design changes

Judging from new product and design change announcements, heating and cooling manufacturers are bullish about 1957 prospects.

"We're confident that in 1957 we will add a 50% increase to our 1956 business," said Albert S. Bross, sales vice president, O. A. Sutton Corp, after distributor merchandising meetings. He told New York newsmen that sales of the Vornado line of room air conditioners this year are almost twice those of 1955 in spite of the cool summer.

Vornado design changes have concentrated on fans. The two-speed Golden Sierra model boasts an air purifier, timer, filter, thermostat and pilot light. It is reversible, and can serve as circulator or exhaust and intake.

Year-Round Sales Trend

"Market studies point to increasing year-round sales of room air conditioners, and their diminishing identity as strictly a summer product." This view of William G. Kronauge, sales planning manager of room units for Kelvinator Division, American Motors Corp, was cited as the firm gave an early introduction to the '57 lines.

Kelvinator's 10 models have two-directional cooling, with capacity and control to cool two adjoining rooms with the same unit, Kronauge said. A 17¾-in. deep "Thin-Style" series is new to the line.

Within three to five years, sales of Carrier Corp room air conditioners will hit 200,000 units annually, predicts Cloud Wampler, board chairman. Production in 1957 will be double this year's, he said. About half of a $25-million expansion is going into the firm's Syracuse plant, which includes room conditioner production.

Their new models, he said, will produce full-rated cooling capacity and reduce electrical requirements. The ¾-hp units pull 7½ amp, 1-hp units operate on 115 v and draw 12 amp. Other sizes range to 1½ hp.

Redesigned fans have been announced by General Electric Co. The restyled roll-around P-2 model adjusts to heights between 45 and 62 in. and has a new safety grill. The all-purpose A-2 has a lighter cabinet for portability. A new 20-in. portable, W-2, can be used for windows or circulation. Eight other models complete the line.

Air Blender Set for School Use

A central heating-ventilation system for schools that can heat one room while cooling another at the same time is a recent Westinghouse Electric Corp development. The air blender solves the problem of overheated and underheated schoolrooms by providing a constant mixture of outside air with heated air. Tempered air is brought in through a central source to ventilator units in each room where it gets added heating as needed. If solar radiation boosts temperature, more unheated air is brought through the blender units. Cooling capacity is limited, the company says, only by temperature of outside air.

Control Improves Load Factor

An electric time pulsing regulating device that diminishes peak demand and furnishes better load factor has been introduced. Econotrol company, Montreal, Canada, says the device was designed for electric heating control but will work on any heating load. In early installations, utilities are able to service three similar dwellings with the same transformer capacity formerly needed for two, the firm says.

In the heat pump field, York Corp reports an enthusiastic response to the air-source model introduced last April. The elimination of heat pump capacity deficiencies at low temperatures and removal of the low load factors of strip heaters has attracted interest of "scores of utility engineers." York has published a brochure with technical data on the system.

Cabinet baseboard, and portable heaters are gaining some refinements. Items:

- Designed for large hard-to-heat places like lobbies, gyms, and offices, a cabinet model of Fedders-Quigan Corp delivers up to 117,300 BTU's/-hr, is adaptable to free-standing, semi-recessed, recessed installation or wall or ceiling mounting.
- Compact baseboard radiant heater utilizing conductive and emissive powers of an anodized aluminum heating surface is new Marviray, Inc, product. It operates at 750 w on 115, 208, 230 or 245 v ac, measures 48 x 8 x 2⅛ in.
- A tri-core element and a polished reflector are features of a portable radiant circulating heater. Electromode Division of Commercial Controls Corp says the unit gives even, warm air circulation.

BRIEFS

Heat Pump Deal Cookin'

Chances are 50-50 that heat pumps will be installed in Arkansas Air Force base. Arkansas P&L has suggested the units for a 1,500- home project.

Sell 'Em at Home

A brochure on the need for supplemental heat has been mailed to 30,000 Philadelphia Electric Co customers. Expanded from a successful try last year, the mailing goes to pre-selected prime prospects for space heating. Another pamphlet went to 10,000 industrial and commercial prospects.

An All-Electric First?

With the installation of GE Weathertrons in a Canton, Ohio, plant, Ohio Power engineers wonder if they have one of the first all-electric industries. The plastic products maker will employ 75 to 100 workers.

Boon for Off-Peak A.C. Sales

Peaks and valleys of room air conditioner sales are under Westinghouse Electric Corp attack. Its distributors will buy back from dealers on July 15, 1957, a number of units equal to the dealers' January through May purchases and acceptances. The move will help boost non-seasonal buying and steady production.

do rusty conduit threads cost more?

NO DOUBT ABOUT IT . . SO PITTSBURGH STANDARD CONDUIT THREADS ARE HOT-DIP GALVANIZED

Cost for rigid steel conduit must be measured by both purchase price *and* labor cost for putting the conduit in place. If workmen's time must be spent in chasing rust from threads, then you pay more—make less on the job. That's the reason Pittsburgh Standard gives you hot-dip galvanized threads on hot-dip galvanized conduit *on every size through 6-inches*. And because Pittsburgh Standard owns the world's most modern conduit mill, these hot-dip galvanized threads come to you *at absolutely no extra cost*. This is a major advance—company after company is rewriting specifications to call for Pittsburgh Standard Conduit. Available from your Pittsburgh Standard wholesaler, or write *Pittsburgh Standard Conduit Co., 61 Bridge St., Pittsburgh 23, Pa.*

PLANTS AT MORRISVILLE & ETNA, PA.

RIGID STEEL CONDUIT • ELECTRICAL METALLIC TUBING • ELBOWS • COUPLINGS • FITTINGS

A fact for every electric utility

FROM COLD RESERVE TO FULL LOAD IN 60 SECONDS

Impossible? Not at all. For this is a characteristic of Electro-Mobile Power. From a cold start a 1000 kw unit can deliver its full load *in less than sixty seconds.*

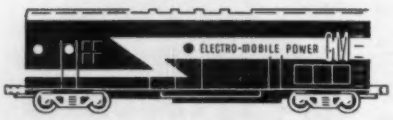
This is true of one or one-hundred units, 1000 kw or 100,000 kw—steady full-load power in far less time than required by any other prime mover, except a spinning unit.

But spinning reserve is *costly* reserve. By letting Electro-Mobile Power supply reserve requirements you not only eliminate running losses, but investment per kilowatt is lower. Efficiency of present stations will improve, too, because generators can be run at a higher load factor.

Further, by placing Electro-Mobile Power at the points of load, transmission loss is reduced and less reserve is required to maintain service. Another advantage: EMP units are available with impulse starting or stopping which permits unattended operation from any location.

How might a multi-megawatt system of Electro-Mobile Power units apply to your system? We'd like an opportunity to sit down with your engineers and discuss it. Contact your Electro-Motive representative, he has the details.

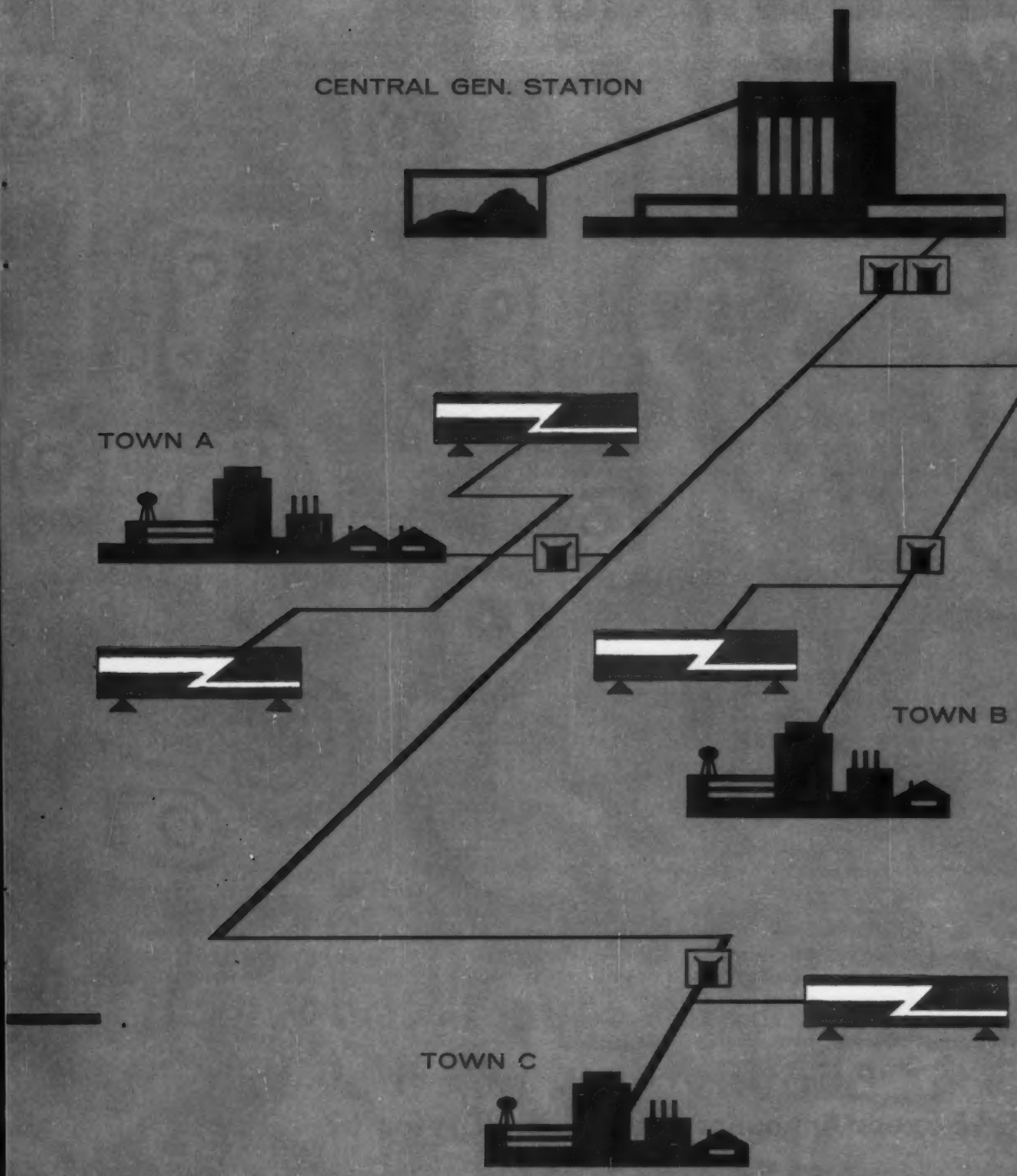
Increased demand of 5000 kw at central station picked up in less than 60 seconds by four 1000 kw Electro-Mobile units.



RAIL CAR—1000 kw units for use on sidings or placed on piers for semi-permanent use.

TRUCK TRAILER—500 kw units offer excellent mobility for many temporary applications.

This simple diagram suggests how Electro-Mobile Power located at points of load can effectively reduce reserve requirements and costs. Assuming a 1000 kw line loss at time of peak from the central station, only four 1000 kw EMP units are needed to pick up a 5000 kw demand. Naturally, line loss will vary according to the make-up of the system. However, an analysis of your peak line losses will show what savings can be expected.



ELECTRO-MOTIVE DIVISION
GENERAL MOTORS LA GRANGE, ILLINOIS
Sales Offices in Chicago, New York, St. Louis, San Francisco

HEATING CABLES are tied directly to concrete-reenforcing wire and buried an inch below the smooth top cement surface

A CLEAN SIDEWALK, free of snow and ice, is the result of a flip of a switch. No more tiresome shovelling to boot

Electric Snow Removal Adds 13.4 Kw to Load

With winter and snow shovelling ahead, utilities may well be interested in this electrical snow-removal installation that adds an extra 13.4 kw load to West Penn Power Co's lines.

Snow and ice removal are no longer irksome chores at Elks County Savings & Loan Association in Ridgeway, Pa., since their electrically heated sidewalk has been installed. All the custodian must do now is flip a switch; snow and ice already on the walk are melted and falling snow is gone almost as soon as it lands.

The elimination of a potential safety hazard to passing pedestrians and the reduction of snow-shovelling and ice-scraping expenses emerge as important, timely sales points.

The sidewalk area is approximately 353 sq ft. The cable used is plastic-coated nichrome heating wire—Chromalox "Thermwire." Cut to 80-ft lengths, it was tied to the concrete-reenforcing wire, and the entire assembly was rolled on the sub-layer of wet concrete. It was then held with wooden pegs. Later, the assembly was covered to a depth of 1 in. with the top layer of sidewalk.

Cable power consumption is 7 w/ft; 24 80-ft lengths were used to give a unit-area consumption of 35 w/ sq ft.

The cable is numbered in three series. The series are staggered, so that cables in series No. 1 cover the entire width of the sidewalk, as does No. 2 and No. 3 series. They are connected in series, two 115-volt cables across one phase of a 3-phase, 250-volt source in the basement under the building marquee. Three separate switches, each controlling one third of the cables, were used. These in turn were connected to a pilot-lighted master switch on the first floor.

Reportedly, a failure of one of the cables does not present any insurmountable problems, since it can be disconnected without seriously imparing the operation of the rest of the system.

The advantages of this electric one seem to be apparent: There is no boiler for steam or hot water, no plumbing; no pump; no relays; and nothing to wear out.

Elco Electric Co of Ridgeway installed the system.

PG&E Execs Announce Promotion Plans for '57

New advertising campaigns to promote electric appliances locally and to sell its service area nationally were announced during a presentation by an executive foursome from Pacific Gas & Electric Co, before the Electric Club of San Francisco recently. The presentation included future sales goals and estimated capacity additions.

Beginning the first of the year, PG&E will advertise in eight national business publications to tell of the industrial growth and to sell the business opportunities in its service area. This was reported by Robert R. Gros, vice president. Another first for the company next year will be the sponsorship of a television program to build load through promotion of electric appliances. The new show, the "O. Henry Playhouse," will be carried on eight television stations to blanket the PG&E area.

Gros also said that beginning this month (November), PG&E will provide 27 million advertising impressions per month throughout its service area. These ads, to emphasize

(*Continued on page* 171)

D. W. Gunther, Mgr. Materials Engineering, points out some of the controls that make sure the quality designed into Westinghouse products is delivered to you.

How Westinghouse takes trouble out of your workaday world

Trouble-free equipment is no accident. At Westinghouse, the quality that keeps your equipment out of trouble starts on the designer's board, is assured . . . often enhanced . . . by material selection, and it is safeguarded by precise control of production.

Take one. Any Westinghouse product. You can't miss. From production order to shipping platform, this is *your apparatus* . . . its quality, *our responsibility.*

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

We're proud of the men who stake their reputations on these motors.

147 OK's, 26 double-check signatures say "it's right"!

That makes the Westinghouse powerhouse motor — available in ratings to 5,000 hp — the nearest approach to "won't fail, won't let you down" in the industry.

Indoors or outdoors, it is designed to do its job — withstanding dirt, heat, moisture, or loads beyond normal service requirements. Its materials are specially selected, many specifically developed, to meet unusually severe performance standards.

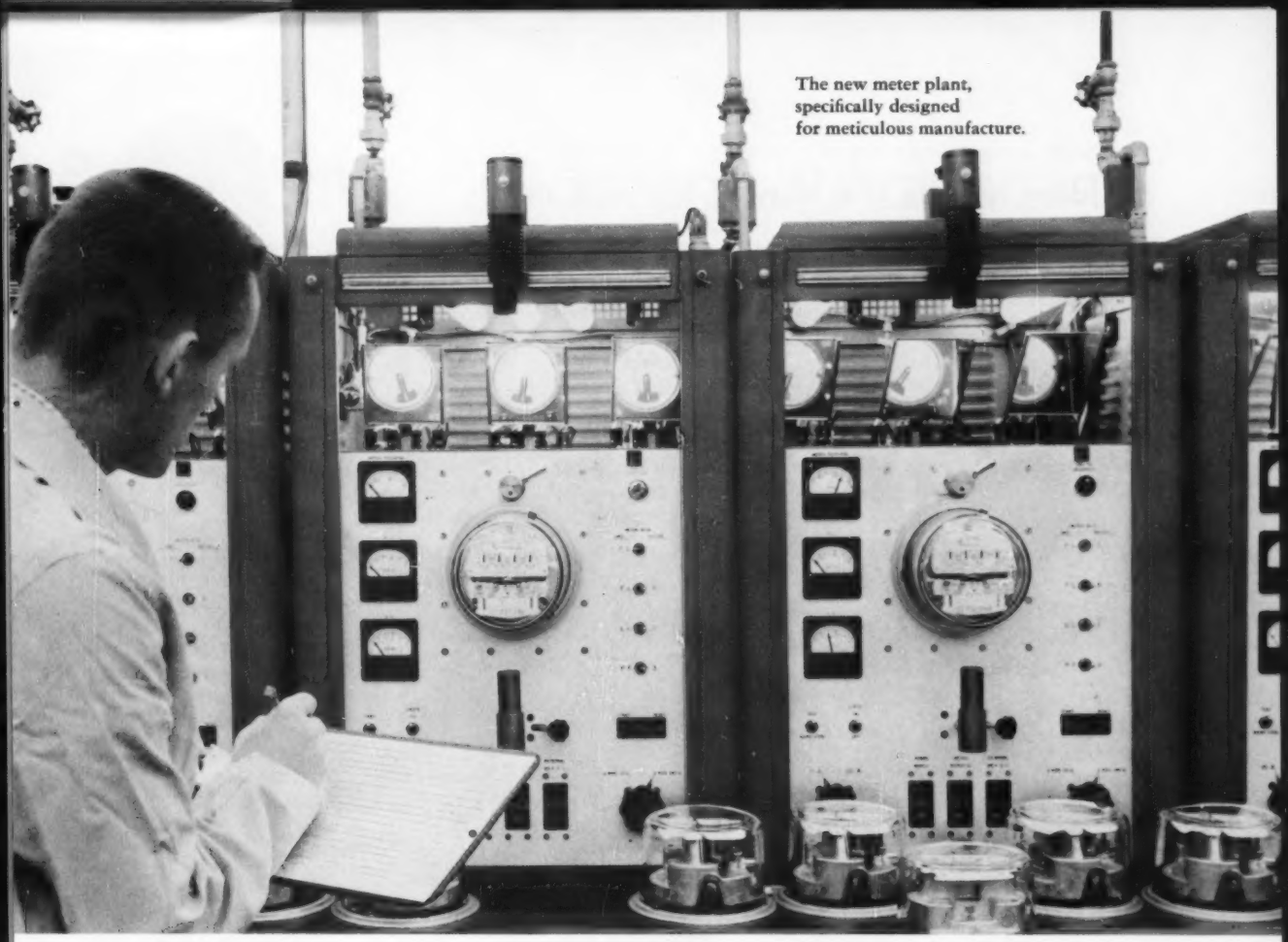
But our real point of pride is the conscientious check - on - check manufacturing procedure that culminates in 26 special in-process inspections, signed by responsible department supervisors. Your motor is right, step by step. Twenty-six personal reputations and careers are bet on it.

Supervisor of inspection signs the release — here an 800-horsepower, 10-pole induction motor is checked over to make sure Micarta® slot wedges and stator windings are perfect. Following this inspection, windings are tested for grounding.

High-frequency test — inspector tests for turn-to-turn faults as the rotor arm slowly revolves, inducing voltage into the windings. This check reveals any short-circuited windings, assures that coils are correctly connected.

Vibration test — balancing equipment checks rotor shaft, frame and bearing brackets for vibration, determines amount and location of imbalance.

WATCH WESTINGHOUSE



The new meter plant, specifically designed for meticulous manufacture.

A million out of a million are right!

100% inspection is key to uniform meter quality

You get uniformly accurate and dependable meters from Westinghouse for the simple reason that substandard units are not finished or shipped. The "go, no-go" test above, at line's end is no mere sampling. It checks *every* meter. The automatic full-load, light-load and power-factor test must be passed or the meter will not be shipped. Quality production with testing like this is one of the reasons why the Westinghouse meter is the only meter *guaranteed for life.*

Vibration and drop tests are conducted regularly to discover any possible source of damage in shipment. Specially designed packaging for Westinghouse meters has been awarded the seal of the National Safe Transit Committee.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Building quality is a way of life with men in transformer and voltage-regulator production.

Quality is a certainty . . . Every regulator is given a complete operation and insulation check prior to shipment. Here the CJ-1 relay settings get a final monitoring.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Proved on the production line . . .

Quality that's designed in, stays in

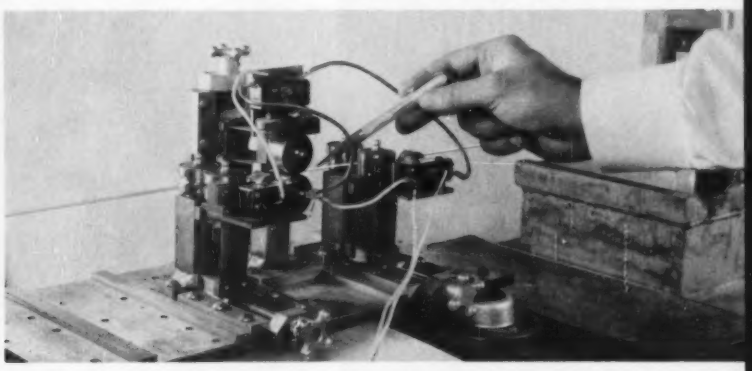
The heart of a program that has actually pitted department against department in plant-wide contests to assure manufacturing quality is this slogan: "Quality must be ***built*** into a product; it cannot be ***inspected*** into it!"

In addition, all Westinghouse foremen spend one week end each year attending a QUALITY SEMINAR where they exchange new ideas and experiences.

Quality control is more than a procedure at Westinghouse. It's an attitude, inspired by team spirit, proved by on-the-line tests. It's your best assurance that Westinghouse equipment will give you the trouble-free performance you want.

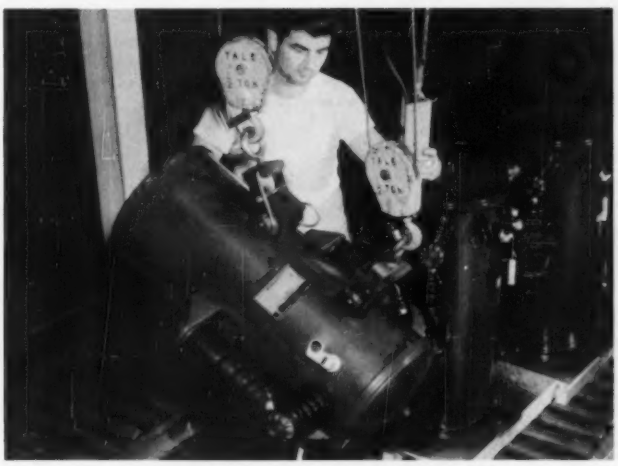
Basic "take it" ability of Westinghouse apparatus, mechanically and electrically, is thoroughly proved on the production line — far beyond service requirements.

Quality is wound in . . . High-frequency test checks turn-to-turn and layer-to-layer insulation both *before* and *after* assembly of transformers and regulators. Pre-assembly testing is vital, since insulating value of oil might temporarily hide flaws detectable only at this point.



Quality is 3,000 miles long . . . Minute burrs and imperfections on copper wire and strapping can damage insulation. That's why Westinghouse perfected a new system of detection that eliminates any flaw greater than 2 mils. With insulation at a minimum of 20 mils, the protection factor is better than 10 to 1.

Quality is three skins deep . . . Westinghouse "Coastal Finish," an exclusive three-layer protective skin for transformers, and regulators, forms a granite-hard, weather-resistant surface. Every transformer gets a minimum paint thickness test and a paint adhesion test.



Quality even upside down . . . Tilt test for transformers is the last check on the shipping room floor against oil and air leaks. Pressure tests are also applied before painting, and again after painting when the unit is filled with oil. Every transformer produced receives preproved performance checks like these.

While many production tests are complex, these are direct, simple, effective.

Trial by vacuum — entire interrupter chamber is evacuated to less than one micron with the vacuum manifold above as a final check on soundness of joints and seals; next operation, filling the unit with sulphur hexafluoride.

Trial by water — here the completely assembled interrupter chamber takes the bubble test. In this check, the chamber is filled with dry nitrogen to 30 pounds pressure; leakage, if it exists, is instantly detected.

Here a bubble is a sign of trouble

Westinghouse gas-type interrupters like the VLB switch can't tolerate leaks, or they're short-lived on your lines. Bubbles in water-immersion tests point straight to any potential source of trouble.

All valves and gauges are subjected to 30 pounds pressure with dry nitrogen and "dunked" to prove themselves before they get onto the production line. The operating shaft seal is given the same test and then, after complete assembly, the entire unit is again checked for bubbles.

To assure complete tightness of all joints and seals, the entire interrupter chamber meets a much tougher test. It is evacuated to less than one micron and held there for 20 minutes to check against any pressure rise.

Only then may it be filled with the sulphur hexafluoride which will effectively quench arcs through its long, dependable service life.

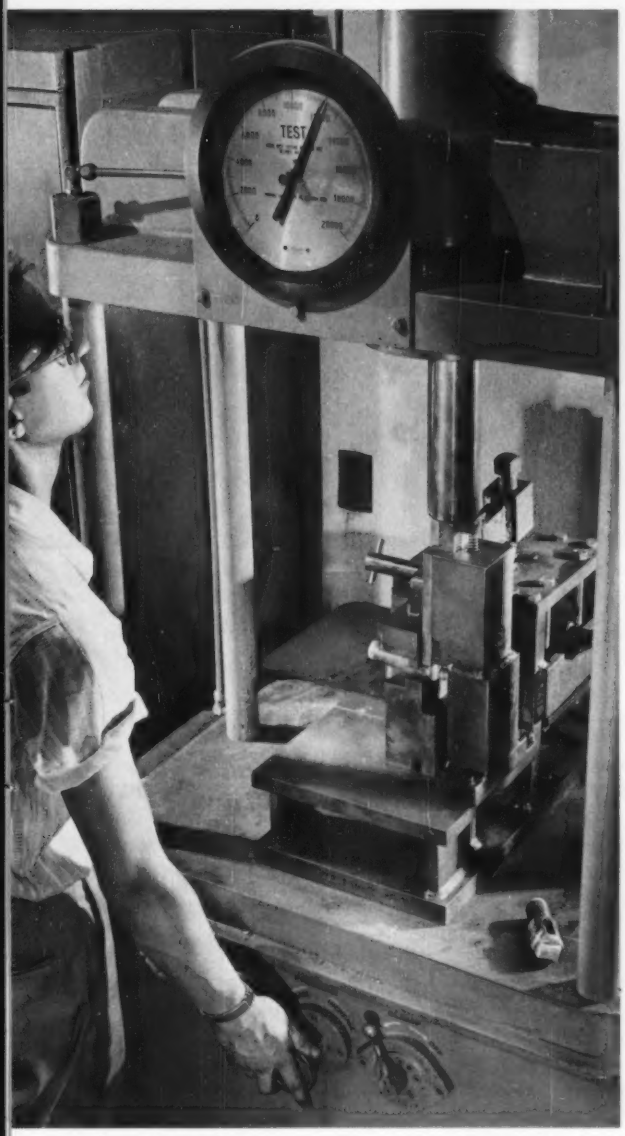
Precision manufacturing techniques, proved by simple tests like this, make the VLB interrupter safe for your system.

WATCH WESTINGHOUSE

Increased breaker ratings add importance to testing of components.

Quality to its finger tips

Power breaker contact tips take 12,000-lb. stress



The brazed joint between silver contact tip and Cupaloy body of every single breaker contact is stressed to 12,000 lbs. This test is made on all curved joints, from both directions.

Transmission of larger and larger blocks of power has sent breaker ratings skyrocketing . . . and the greater the capacity of the breaker, the more important it becomes that every component be checked for utmost dependability. That's why Westinghouse tests breakers, right down to their contact tips.

The business end of the interrupter contact in a Westinghouse De-ion® grid is a silver-tungsten tip brazed to a Cupaloy* body. Before assembly, every piece is 4 times tested for quality and strength of braze. The ability of the breaker to stand up to the mechanical stresses of high power faults and high-speed reclosing is preproved with the severe quality tests shown here. For instance, the Rockwell hardness test: After brazing and heat-treating, every single Cupaloy body is checked for hardness, to make 100% sure breaker contacts will withstand the punishment of short-circuit operation.

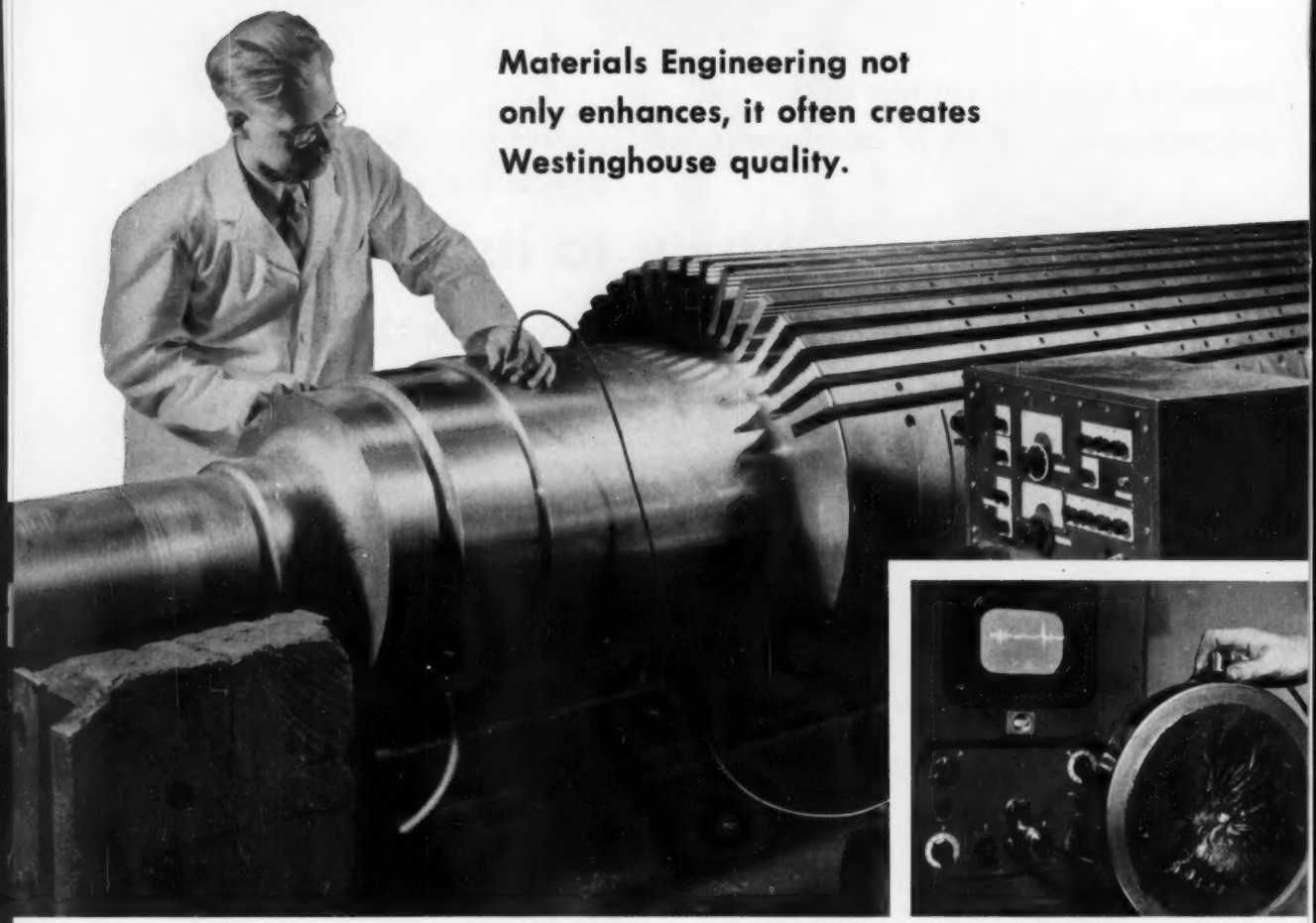
These are just a few of the tests Westinghouse breakers go through on their way down the production line. The doubts are hammered out — to give you all the performance that good design intended.

*Trade Mark

In the ultrasonic test, the electronic reflectograph proves that brazed areas are free of even microscopic faults.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Materials Engineering not only enhances, it often creates Westinghouse quality.



Ultrasonic test — 34 feet of turbine-generator rotor is thoroughly checked in minutes by high-frequency sound. Cracks, inclusions or other flaws can be detected instantly in this production line, nondestructive test. (Right) Basic materials are also tested to design strength and beyond; they go into production a thoroughly known quantity.

Torture, look and listen

By this the finest material is selected . . . or developed

More than 260 full-time engineers and technicians utilizing a multi-million-dollar laboratory team up with the experienced design staff to give Westinghouse the foundation on which conscientious craftsmanship builds quality.

They set standards for basic materials and establish line checks by which standards are enforced. But more than that, they probe for new materials, new principles for solving design or procurement problems.

Thus, Westinghouse quality rests on a firm tripod: Top design engineering meets service requirements; materials engineering matches design demand; production faithfully meets the standards of both.

This facility of Westinghouse is unequaled in the industry. That's why it's right to say, "You can be *Sure*, if it's Westinghouse."

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

CP 1036

A 75-kw load, and some civic planning put . . .

More Than 3 Coins in This Fountain

This giant $250,000 electric fountain, recently completed at Greater Pittsburgh Airport, is another example the ever increasing use of electric power in public display and decorative projects.

The six-tiered water display is believed to be the largest electric fountain in the world. Its 110 jets are capable of pushing water plumes 75 ft in the air. Associated equipment, such as the multicolored ground-level and underwater floodlights, motors and control equipment add a bonus to Duquesne Light Co.'s lines of 75 kw. Electrical components and engineering assistance were furnished by General Electric Co.

A specially designed sound system has been built into the fountain to provide soft music. It is surrounded by 12 landscaped gardens.

PG&E Promotion Plans

(*Continued from page* 162)

electric appliances, will reach readers through newspapers, magazines, bill enclosures, and truck and outdoor posters.

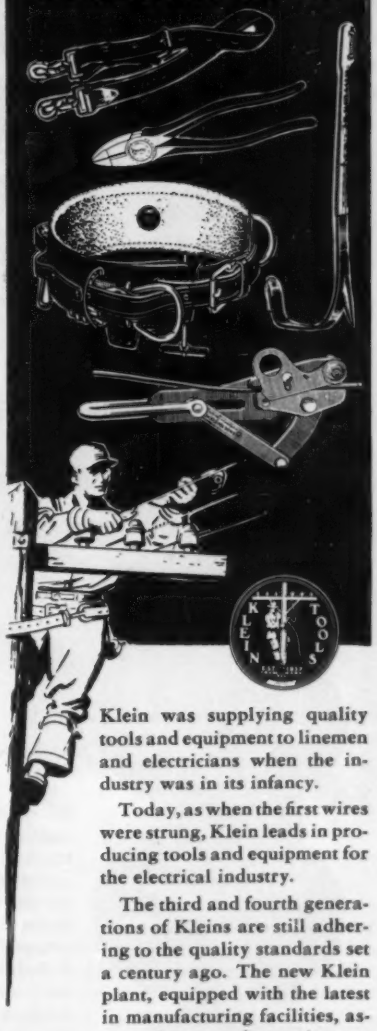
The sales picture, drawn by O. R. Doerr, vice president of sales, will include connected load of 7.5 million kw by 1961. He estimated that by the end of this year about 1.3 million kw of new connected load will have been located in northern and central California. Included in next year's goal of 1.35 million kw of new connected load are almost 756,000 new electric appliances worth about $176 million at retail prices. Doerr said that PG&E is shooting for these average annual uses per customer by 1960 —Industrial—655,000 kwhr; agricultural—55,000 kwhr; commercial—10,000 kwhr; and residential—3,500 kwhr.

Walter Dreyer, vice president and chief engineer, predicted installed capacity must jump to 5.5 million kw by 1961 from the current capacity now exceeding 4 million kw. Almost 800,000 kw in new generation will come from hydroelectric projects planned by the company and other agencies. By 1970, he estimated that 10 million kw will be needed, of which about 3 million kw will be in new steam-electric stations. Dreyer indicated that some of this new capacity may be nuclear power.

In introducing his vice presidents, Norman S. Sutherland, PG&E president and general manager, pointed

KLEIN

FOR GREATER SAFETY, BETTER PERFORMANCE



Klein was supplying quality tools and equipment to linemen and electricians when the industry was in its infancy.

Today, as when the first wires were strung, Klein leads in producing tools and equipment for the electrical industry.

The third and fourth generations of Kleins are still adhering to the quality standards set a century ago. The new Klein plant, equipped with the latest in manufacturing facilities, assures better, safer equipment, wherever power lines or communication lines are strung.

Write for your FREE copy of the Klein Pocket Tool Guide listing Klein equipment and giving valuable information.

Mathias Klein & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

the new
complete source
of information on
fine FANNER
Superformed
LINE CONDUCTOR
ACCESSORIES

the new
FANNER CATALOG

This new FANNER Catalog illustrates and describes the wide range of Superformed Line Conductor Accessories . . . gives selection tables, application data and suggested installation methods. Get acquainted with this catalog now so that when you need accessory items for overhead distribution and transmission lines, you can take advantage of the many extra features of Fine FANNER Superformed products. Each product in the FANNER Superformed line is precision manufactured to install easier and perform better on the job. Careful packing insures safe delivery and simplified storage. Highest quality materials provide long life regardless of the type of installation. With all their extra features, FANNER Superformed products cost no more than ordinary products.

For the latest data on line conductor accessories — information that will be of exceptional value to you, write for the new FANNER Catalog EP6 today!

Licensed for use under Patent No. 2,275,019

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park • Established 1894 • Cleveland 9, Ohio

AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

out that his company has spent $1.6 billion since 1942. This amount is equivalent to all other industrial plant expansion in the company's service area. Present generating capacity, he said, now is double the amount which existed at the end of World War II.

LBE BRIEFS

Newspapers Get Behind LBE

Fifty-six out of 90 newspapers in Virginia Electric & Power Co's area all carried Live Better . . . Electrically supplements from Oct. 22 through Nov. 1. This real blitz program was spearheaded by C. E. Anderson, VEPCO's residential sales manager. Much of the work was reportedly done by Cargill & Wilson, his agency.

Chicago Apts Need Rewiring

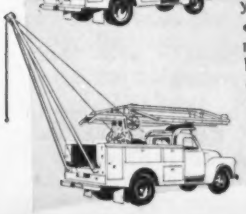
With their tenents constantly being reminded to live better electrically, more and more Chicago landlords are facing the fact that rewiring is a must, according to the windy city's Electric Association. EA recently got out a folder to more than 20,000 apartment house owners and managers, reminding them that tenents have come to expect the conveniences and comforts of modern electrical living. The folder goes on to say that while more than 60 appliances are in use today, hundreds of apartment dwellers are limited to the bare necessities by inadequate wiring. EA claims that increasing vacancies are partly the result of this, and urges that owners and managers investigate step-by-step rewiring plans.

Boston Ed Fall LBE Program

"Electrical Living Week, featuring a program to help customers live better electrically, has been in progress this fall at all Boston Edison Co Customer Shops. The schedule began Oct. 1 and ran through Nov. 9. Edison Home economists from the company's Home Service Division demonstrated the latest electrical appliances. Specially reduced prices and big trade-ins also were featured during the fall LBE campaign.

UTILITIES EXPECT MORE FROM POWERS American

Series 350
SERVICE-MAINTENANCE BODY
HANDLES 3 JOBS



Series 450
MAINTENANCE AND CONSTRUCTION BODY
Another unique design, ideal for municipalities!

DUAL PERFORMANCE . . .

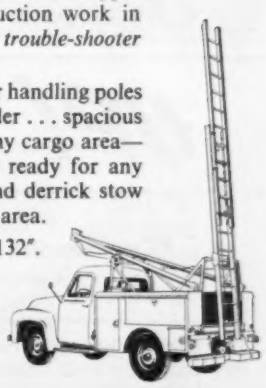
- Revolving aerial ladder for overhead work—revolves 360°—furnished in a height best suited to your needs.
- Underslung winch permits use of derrick—for handling 35′ poles—without interference to aerial ladder.

The Series 450 is available in 108″ and 132″ length.

This extremely versatile body will handle all types of service, maintenance, and construction work in small operations . . . and is an ideal *trouble-shooter* for larger utilites.

An easily-erected fold-over derrick for handling poles up to 35′ . . . a 24′ extension ladder . . . spacious bin-equipped compartments . . . roomy cargo area—all combine to make the Series 350 ready for any job at a moment's notice. Ladder and derrick stow above body . . . never obstruct cargo area.

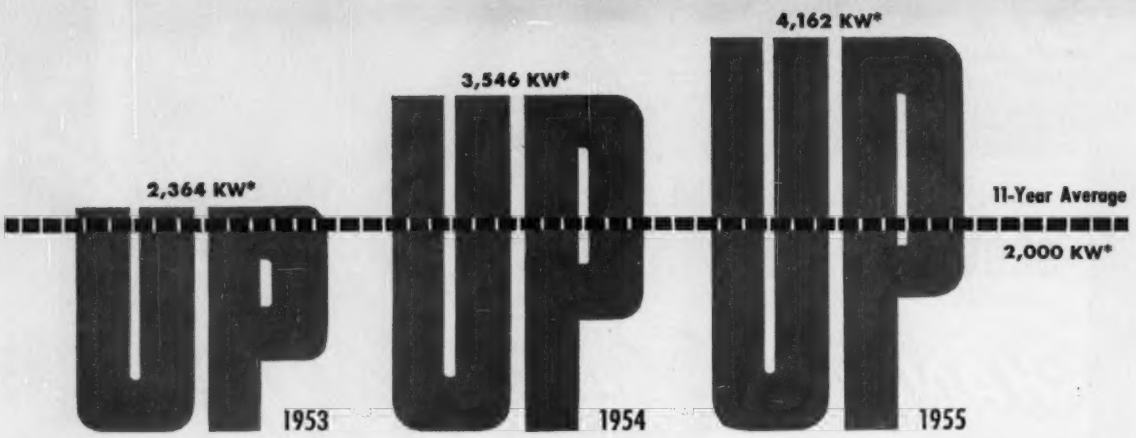
In four lengths—84″, 90″, 104″, and 132″.



Get complete details and price information. Send for Powers-American Series 350 Bulletin #109R or Series 450 Bulletin #118 *today*.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY · ST. LOUIS 15, MO. • 625 CEDAR ST. · BERKELEY 10, CALIF.



**Average new commercial cooking load per year per utility reporting in ELECTRICAL WORLD's surveys. See "2nd Commercial Cooking Survey," ELECTRICAL WORLD, August 27, 1956, Pages 36 to 51. Reprints available from HOTPOINT.*

		COMMERCIAL COOKING FACTS
UP!	Pennsylvania Power and Light Co.	Over $2,000,000 in new E.A.R. in 9 years
UP!	Appalachian Electric Power Co.	$392,000 in new E.A.R. in 1955
UP!	Atlantic City Electric Co.	Over 5 kw new load per customer, 1955
UP!	Southern California Edison Co.	New load up from 6,900 kw (1954) to 16,920 kw (1955)
UP!	Potomac Edison Co.	Commercial cooking saturation now over 19 kw per customer
UP!	Year end projection, 1956 (estimated)	Up 25%

"Commercial Cooking is Hot Load"

(Editorial: Reprinted from ELECTRICAL WORLD, Sept. 10, 1956, page 5)

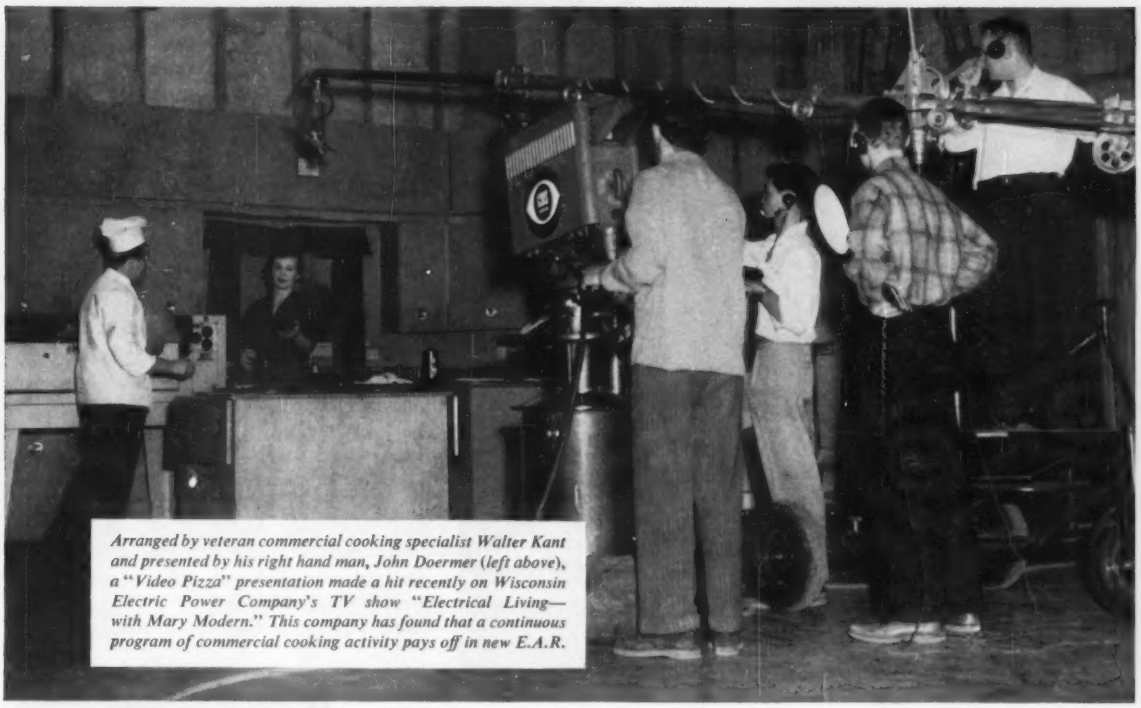
Commercial cooking can no longer be looked upon as just a promising load building opportunity. Today it is solid business.

This is apparent to everyone who read *Electrical World's* second survey in a recent issue (Aug. 27, p. 36). Companies like Appalachian Electric Power and Pennsylvania Power & Light are grossing $2 million and more each year from this single load. Southern California Edison Co. added nearly a half-million dollars of cooking revenues last year.

And the substantial returns are by no means limited only to utilities with large prospect lists. Kentucky Power Co., with only 600 food service accounts to draw on, worked its market for $72,000 in new commercial cooking business last year. Similarly Gulf States Utilities drew $134,000 in new money from only 1,080 prospects.

Cooking kwhr sales for the industry this year likewise look good. Already they're about 25% ahead of '55, according to one equipment manufacturer's estimate.

KW load soars with Commercial Electric Cooking!



Arranged by veteran commercial cooking specialist Walter Kant and presented by his right hand man, John Doermer (left above), a "Video Pizza" presentation made a hit recently on Wisconsin Electric Power Company's TV show "Electrical Living—with Mary Modern." This company has found that a continuous program of commercial cooking activity pays off in new E.A.R.

Like space heating, commercial cooking offers a high concentration of kwhr from few installations. A fully-equipped all-electric kitchen can put a load on a utility's lines of anywhere from 100 kw for a large restaurant to 300 kw or better for a hospital. To a single company with 2,300 food-service customers (the average for the utilities in EW's survey) this means a total potential of:

- 69,000 kw demand (based on a conservative average of 30 kw for each food-service customer). This is the total capacity of a good-sized turbine generator;
- $1¾ million in annual revenues (at $25 per kw).

And, happily enough, commercial cooking diversifies well with other classes of business, has a good annual load factor.

Utilities which go after the load know this. A survey of 34 utilities (EW July 23, p. 97) shows cooking is getting a modest but steadily increasing share of the utilities' commercial promotion dollar—up 43% since 1940. Meanwhile, several other commercial power applications are suffering budget cutbacks.

With at least 533,000 food service outlets in the U. S., whose cooking requirements could total at least 15 million kw, the "poor little rich load" is no longer so poor or so little. As for how rich it is, the figures above speak for themselves.

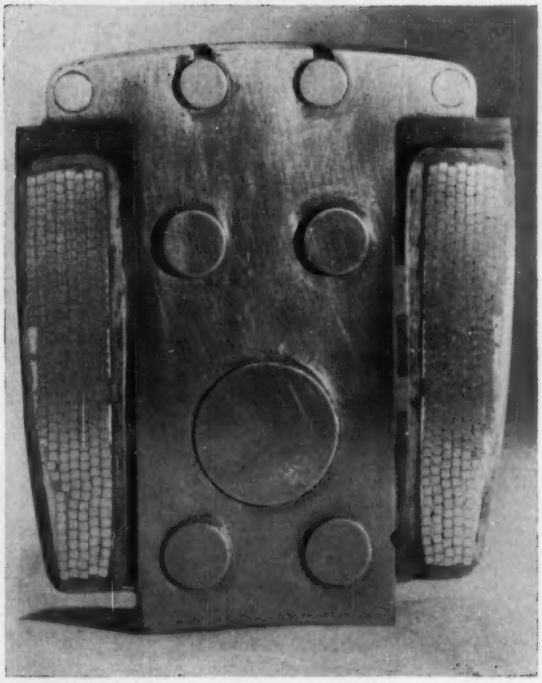
HOTPOINT has a complete assortment of commercial cooking plans, programs, and facts for power companies. Write, wire or phone us and we will make our full resources available to you.

Hotpoint All-Electric Commercial Cooking

Hotpoint Co., a Division of General Electric Company
Commercial Equipment Department, 265 So. Seeley Ave.,
Chicago 12, Illinois

NEW EQUIPMENT

'Integrated' Field Coil



Here is an "integrated" field coil with an insulating system designed to protect electric motors and generators against atmospheric contaminants and destructive mechanical forces. Primary insulation is glass fibers bonded to conductors and pole surfaces with solventless type inorganic resins in a manner which reportedly makes the assembly one piece. Hence, the term, "integrated."

This construction is currently available for synchronous and dc machines said to be subject to severe duty cycling in Class A and B temperature classifications. Studies indicate, according to the manufacturer, that the system will eventually be available for Class H temperature applications.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Cable-Pulling Tool

This cable-pulling tool is designed to provide a simple, safe and efficient method for installing cable and riser conduit on a pole after the cable has been pulled through the riser and into the manhole. Tool has three parts: r to l, an arched trough to guide cable from conduit to riser elbow; a pivoted supporting arm; and a curved support and guide for the free end of the cable when the conduit is raised. Tool reportedly has good performance and helps prevent cable damage.

Cable Equipment Co, Miami, Fla.

Connector Fittings

Welded fittings have been developed to permit field assembly of aluminum buses by use of A-frame connectors with straight-cut tubing. One aluminum fitting has a cylindrical boss in which a straight tube is seated, and a curved saddle for mounting on a tubular connector. Another fitting has two bosses and a saddle. These, with tubing, are combined to form an A-frame used to join one bus above another in substations. The fittings reportedly provide a low-cost welding technique for such frames, make alignment of the buses in air easier, and compensate for changing ground conditions.

Penn-Union Electric Corp, Erie, Pa.

(*More New Equipment on page* 178)

Saw Mill Parkway in Westchester County, New York, was the hardest hit of all thoroughfares. HAPCO Aluminum Poles were swamped with flood waters from the overflowing Saw Mill River, yet remained in service without special maintenance. Note luminaires are still in service.

HAPCO Aluminum Poles Stand Firm in Heavy Flood

When the year's worst storm hit, dashing seven inches of rain in a three day period on the Yonkers, New York area, parkways were swamped, roadbeds demolished, bridges washed out.

Lighting losses were kept to a minimum because highway planners specified HAPCO Aluminum standards and brackets. HAPCO Aluminum lighting equipment retains its original strength and beauty under the most adverse weather and atmospheric conditions. It requires no initial or maintenance painting, offers the highest resistance to rust and corrosion.

Since HAPCO poles are lightweight, they install faster, easier, you begin saving money as soon as you buy. There is a HAPCO pole designed for every outdoor lighting application. Complete information is presented in Catalog HAL-754. Write for your copy today.

HUBBARD

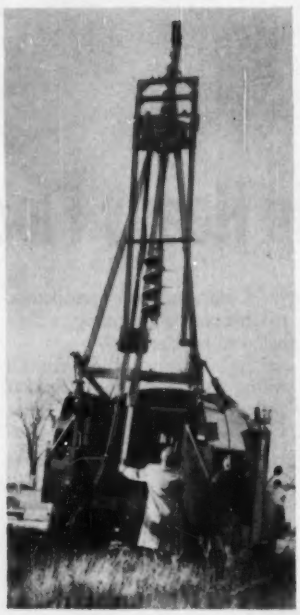
ALUMINUM PRODUCTS COMPANY
Division of Hubbard and Company
Pittsburgh 1, Pa.

Appliance Control Unit

Utilities with inadequate residential wiring problems will welcome this "Automatic Appliance Center", which is designed to allow the simultaneous use of five appliances without the risk of blowing fuses. Equipped with three pull-out extension cords, two outlets, a selector dial and timer, the unit has five circuit breakers with a reset switch for each circuit. Measures 1 ft x 1 ft x 9 in. Has 220-volt, 3-wire input and an output of five 115-120-volt circuits.
Westinghouse Electric Corp, Mansfield, Ohio

Luminaire Heads

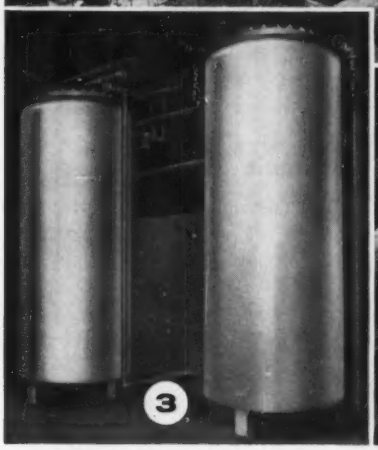
These two luminaire heads are said to provide for a range of lighting requirements. One has a top-mounted photoelectric cell to permit individual control. Both are available with or without internal ballasts for 3,300 or 6,800-lumen mercury vapor lamps in ratings of 100 w at 115 x 230 v or 175 w at 115 x 230 v. A leveling screw and clamp arrangement hold the heads to their supports.
Line Material Co, Milwaukee 1, Wis.

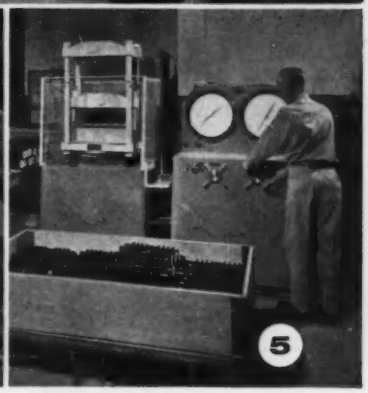


Earth Boring Machine

A recently designed earth boring machine features a new type clutch and brake assembly that is said to provide increased efficiency, longer unit life and greater ease of operation. It is one of a line equipped with hydraulic controls and integral winch. The earth borer, winch and controls are available separately, or as units combined with a specially designed truck body.
Highway Trailer Co, Edgerton, Wis.

(*More New Equipment on page* 180)

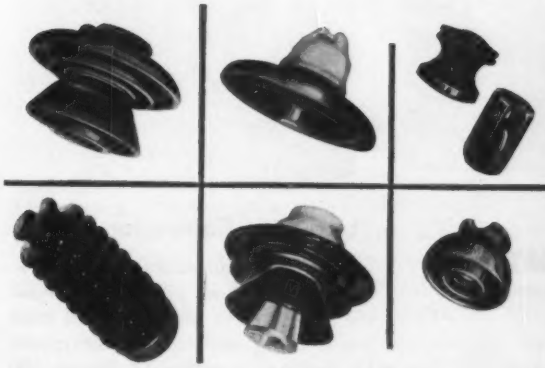




5 BIG REASONS WHY...

VICTOR GIVES YOU BETTER INSULATORS

1. Demand for VICTOR Insulators has necessitated a continual plant expansion running into many millions of dollars. In the last seven years alone, our plant area has been increased 20% to provide greater space for manufacturing, storage and research!
2. This impulse generator in VICTOR'S electrical laboratory, enables our engineers to perform steep front wave tests as well as standard impulse tests.
3. All processing water used by VICTOR is demineralized. VICTOR was the *first* in the industry to install water demineralizing equipment. A patent on our process is now pending.
4. To certify insulator soundness, VICTOR uses black light. Unfired insulators are sprayed with fluorescent material, then subjected to a near ultra-violet light source.
5. This hydraulic testing machine in VICTOR'S specialty porcelain department gives open cutouts and similar insulators a routine calculated transverse load before electrical test.



"BETTER INSULATORS THROUGH RESEARCH"

SPECIFY Victor

Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

ALLEGHENY
CO. ALLEN BRADLEY
ALLIS-CHALMERS MFG. COMP
AMERICAN CAN COMPANY · AMERICA
CO · AMERICAN CYANAMID CO · THE AMERICA
ATOMIC ENERGY PROJECT · ARMCO STEEL CORPORATI
N.Y. BELL TELEPHONE LABORATORIES, INC · BIRD & SON · TH
BETHLEHEM STEEL CORPORATION · BOYD ELECTRIC COMPA
THE BUDD COMPANY
CADILLAC TANK
CONTAINER CO
Y · DETROIT ED
E.I. DUPONT DE
INC · DOESKIN PR
ELECTRIC BOA
O · ESSO STANDAR
G.E. JET ENGINE P
NC · GENERAL MOTO
GIMBEL BROTHER
N.Y. HERCULES PO
HOTPOINT, INC · H
RP · HATFIELD ELEC
INLAND STEEL COMPA
N · INTERNATIONAL HAR
JORDAN MARSH COMPAN
CO · KOPPERS COMPANY,
KRAFT FOODS CO. LANE
CAN · P.R. MALLORY & CO.
MARE ISLAND NAVAL SHI
MARION ELECTRICAL INST
RCO · MIDLAND STEEL PRO
MONSANTO CHEMICAL CO
PORTSMOUTH NAVAL SHIPYARD
CO · PROCTER & GAMBLE CO · PURDUE U
LOS. SCHLITZ BREWERY CO · SOUTHERN
SPERRY GYROSCOPE CO · E.R. SQUIBB
WESTINGHOUSE ELECTRIC CORPORA
N.Y. · WEYERHAEUSER TIMBER
WILSON & COMPANY
WHITMORE &
ZINS
Amp-trap

SHAWMUT

Amp-trap®

Super-Current Slayer

Here are just a few of those who use Amp-trap to prevent the development of heavy short-circuit currents. Lightning fast Amp-trap with its Interrupting Rating of 100,000 Amperes R.M.S. at 600 Volts and below, saves them money. It provides complete and positive short-circuit protection at lowest cost and permits the safe, quick and economical expansion of existing power circuits. It will pay you to investigate Amp-trap. Do it now. Write for Amp-trap bulletin and ask for prices.

In Canada — POWERLITE DEVICES Ltd., Toronto & Montreal

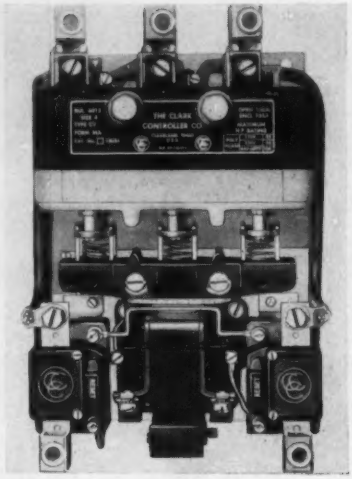
OUR 60 YEAR — FROM LOGAN TO ELECTRONICS — Est. 1896

AMP-TRAPS — "Awake At The Switch"

THE **CHASE-SHAWMUT** CO.

374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Amp-trap · Tri-onic · t-d · C-O-T · Trionic · C-O-T type · FUSE WIRE



Magnetic Starter

The manufacturer claims that the addition of this Size 4 magnetic starter to his line of "CY" starters will permit coverage of over 95% of industry's ac requirements. The Size 4 starter, a vertical-lift type, reportedly allows maintenance and inspection functions to be performed from the front without special tools, and without removing the starter from its panel or enclosure. Starting arc is rotated by a combination of twin-break contacts and magnetic blowouts; this is said to distribute the effects of arcing over the surface of both contacts, minimizing pitting, burning and erosion.

Clark Controller Co, Cleveland, Ohio

Lug-Type Connector

Lug-type connectors for terminating at service switches, terminal blocks, or other locations where space is a factor are available for copper conductors from No. 14 through 500

(*Continued on page* 182)

Free booklet

Tells how new low cost Visual Communication System can improve your control and productivity

INTRA-TEL NEW GENERAL ELECTRIC CLOSED CIRCUIT TV

AVAILABLE NOW IN BLACK AND WHITE OR IN COLOR!

FOR modern management, instantaneous *visual communication* is a vital tool that pays its way in better control and increased productivity.

With the General Electric INTRA-TEL Closed Circuit Television System, you enjoy the full advantages of constant or immediate *visual* contact at new low cost. In most applications where distance, hazards, dust, and other limiting factors are present, you can *see* any number of remote locations at will, in black and white, or in color, as your needs require.

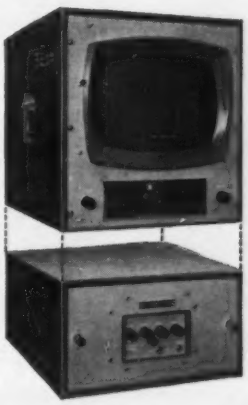
General Electric's new booklet – INTRA-TEL CLOSED CIRCUIT TELEVISION, is just off the press. Ask for a free copy, on your letterhead, please. It tells how easily you can have dependable General Electric INTRA-TEL TV working for you. The booklet answers your questions... contains scores of applications. Don't delay – write for your copy today. Please mention Booklet ECL-53 for black and white, or ECL-39A for color. *Industrial Electronics Division, Broadcast Equipment, Section X19126-10, General Electric Company, Syracuse, New York.*

The basic system is housed in three small, compact units... easy to place, easy to move!

The CAMERA
Type TG-2-A. Takes the picture of subject, scene, or action.

The MONITOR
Type TH-6-A. Shows the picture as taken by the camera. Conventional home-style TV receivers may be used as additional receivers or monitors.

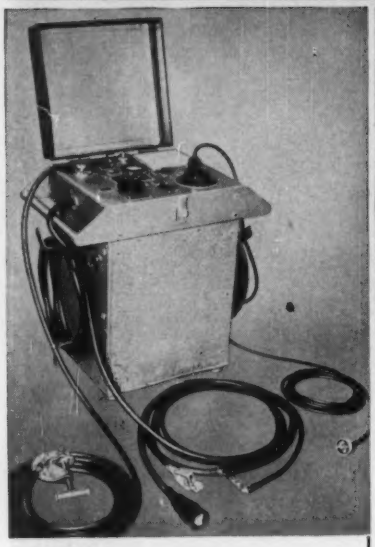
The CONTROL UNIT
Type TH-5-A. Controls and transmits the picture from camera to monitor.



Progress Is Our Most Important Product

GENERAL ELECTRIC

BIDDLE *Instrument News*



BIDDLE IMPULSE CABLE FAULT LOCATING TRANSMITTER

Model 5, 5 KV, 16 MUF

Those companies operating an appreciable amount of 600 volt cable should be particularly interested in this recently developed transmitter. Those having cable in the 2500 volt delta and 4000 volt wye insulation class will also find this transmitter well suited to their needs for proof testing and locating faults on important circuits. Similar applications include the proof testing and location of faults in drag cables such as used with electric shovels in strip mines. Still other applications include extensive lighting circuits such as used at airports and in highway lighting.

BIDDLE IMPULSE CABLE FAULT LOCATOR EQUIPMENT NOW INCLUDES:

Model 3, 25 KV, 1.65 MUF
Model 4, 15 KV, 2.00 MUF
Model 5, 5 KV, 16 MUF

Model 2 Detector for use with each of the Transmitters

Model 1 High Voltage Bridge and other accessories

Write for **Bulletin 65-W.**

BIDDLE DIELECTRIC TEST SET MODEL 1-40 KV

—for measuring d-c current at voltages up to 40 kv when applied to the insulation of such equipment as generators, transformers, bushings and cable.

Carefully considered safety features, excellent output voltage regulation, simple operation, compact design, and facilities for making voltage and current measurements at either polarity have been incorporated in this test set.

The set has a current rating of 25 milliamperes at short circuit, and current measurements can be made down to 0.5 microamperes which is the first division on the microammeter.

Overall dimensions are: height 19½ in., width 13½ in., depth 20 in., weight 120 lbs. All high voltage components are oil immersed.

For complete details, description, specifications, and prices, write for **Bulletin 22-W.**

James G. Biddle Co.
1316 Arch St., Phila. 7, Pa.

Gentlemen: Please send me

☐ **Bulletin 65-W.**
☐ **Bulletin 22-W.**

NAME

JOB FUNCTION

COMPANY

ADDRESS

B-6c1

JAMES G. BIDDLE CO.

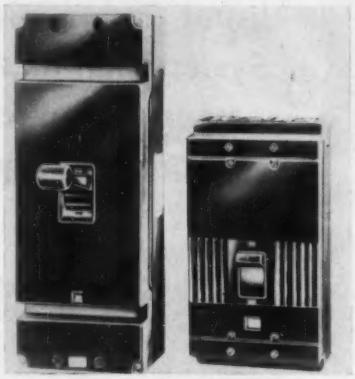
• ELECTRICAL TESTING INSTRUMENTS
• SPEED MEASURING INSTRUMENTS
• LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

Lug-Type Connector

(*Continued from page* 180)

Mcm. Called KA-LUGS, they are said to provide easy installation and dependability. Smaller sizes are forged and the larger ones are cast of high-strength, high-conductivity copper. A plated steel screw provides locking compression. Compact design is said to allow installation in a limited space. **Burndy Corp, Norwalk, Conn.**

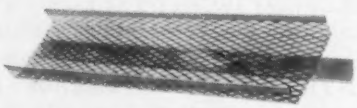


Molded Case Breaker

A compact 800-amp molded case circuit breaker, designated KM-frame, is said to cover applications now using the manufacturer's M,L, and KL-frame breakers. Shorter than previous breakers of the same rating by 6½ in., it reportedly can be used for all ratings from 125 through 800 amp.

The new breakers are available in 2-pole designs rated 125 to 800 amp, 600 volts ac and 125 to 600 amp, 250 volts dc; and 3-pole designs in ratings of 125 to 800 amp, 600 volts ac.

Interrupting ratings of the breaker are 50,000 amp RMS asymmetrical at 240 volts ac; 35,000 amp at 480 volts ac; 25,000 amp at 600 volts ac; and 20,000 amp at 250 volts dc. **General Electric Co, Plainville, Conn.**



'T' Bar Long Span

This "T" bar long span has been introduced by the manufacturer as an addition to his system of expanded

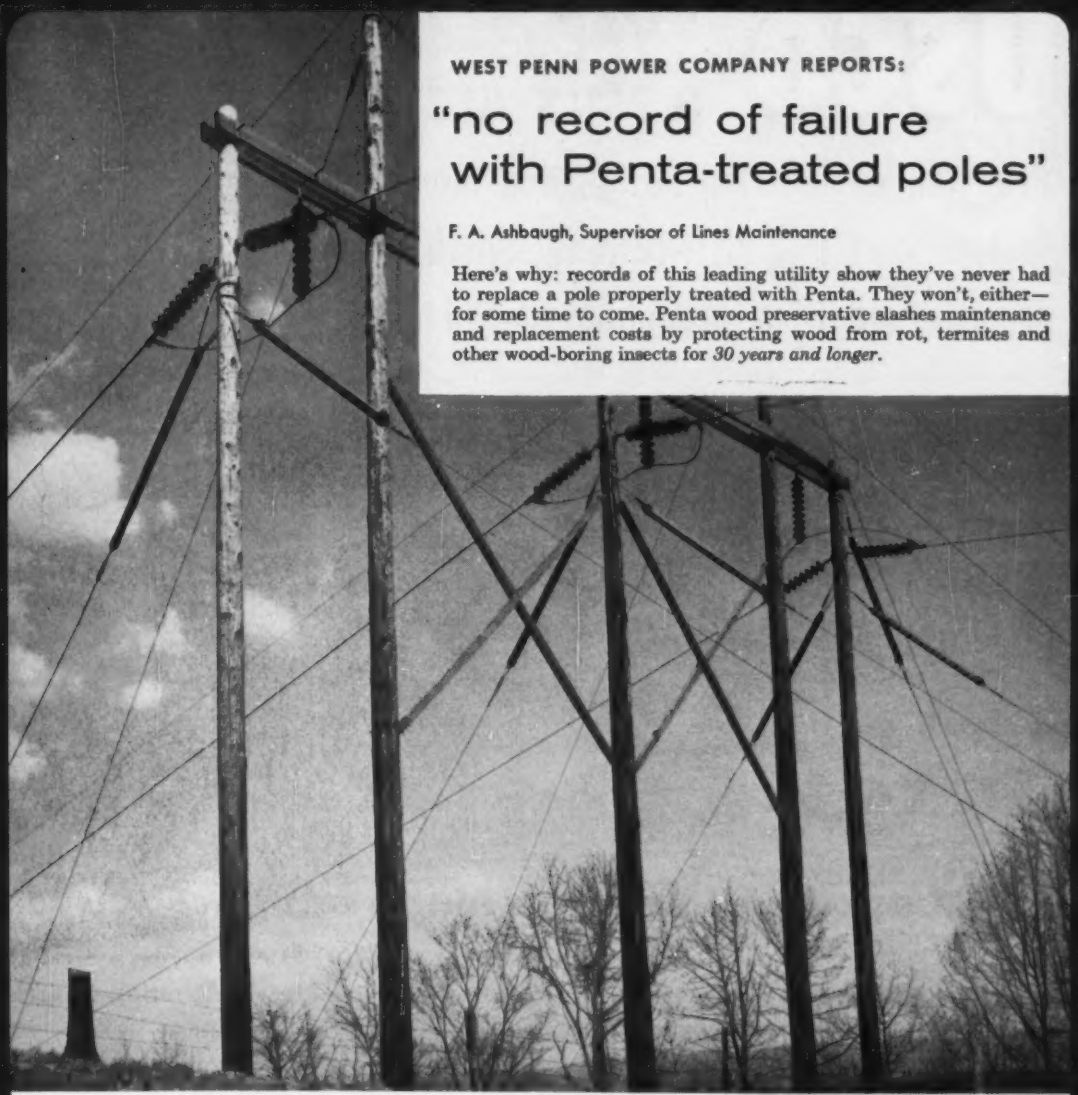
(*Continued on page* 184)

WEST PENN POWER COMPANY REPORTS:

"no record of failure with Penta-treated poles"

F. A. Ashbaugh, Supervisor of Lines Maintenance

Here's why: records of this leading utility show they've never had to replace a pole properly treated with Penta. They won't, either—for some time to come. Penta wood preservative slashes maintenance and replacement costs by protecting wood from rot, termites and other wood-boring insects for *30 years and longer.*



"All the wood elements of this structure in Westmoreland County, Pa.,—crossarms, X-braces and guy insulators—are Penta-treated. In 16 years we've had no record of failure of poles properly treated with Penta," says Supervisor Ashbaugh.

"Our employees like the cleanliness of Penta-treated lumber." And well they might! Clean Penta-treated poles don't burn hands or stain clothes. Installations are faster, easier.

You can measure Penta protection easily, accurately. When increment borings from a Penta-treated pole are chemically analyzed, you know how much Penta remains in the wood at any given time.

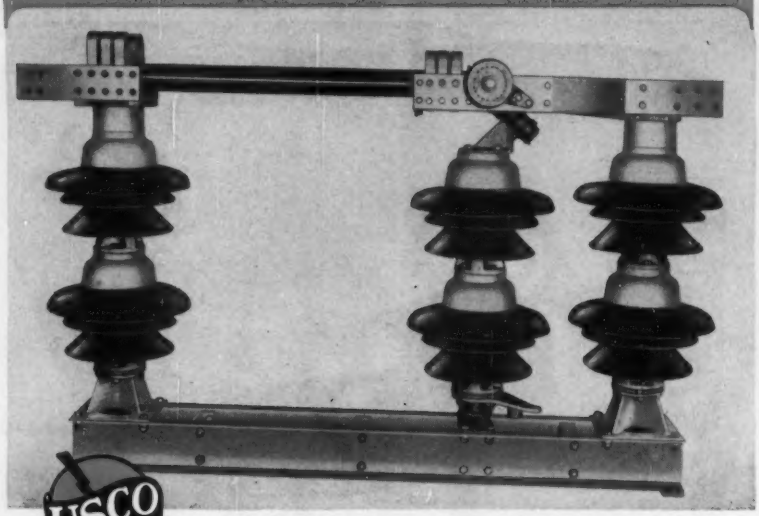
FOR A FREE COPY OF "Penta for Poles and Crossarms," write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. PI-12, St. Louis 1, Mo.

MONSANTO

Where Creative Chemistry Works Wonders For You

USCO TYPE G-45 3 PST SWITCH

Precision engineering design and manufacture kept this high-current switch in excellent condition throughout rugged test



Available 15-69KV, 2000-4000 amperes. Shown is one pole only 69KV, 2000 ampere switch.

Test results show that the G-45 Switch will operate cooler and give maintenance-free operation under all conditions. This switch employs high-pressure contacts in the jaws and hinge. No shunts are used in the construction. Current-transfer materials in the contacts are bus-bar copper and pure, heavy silver. See the official test data to the right . . . compare it with others.

Official Test Results Type G-45

69KV—2000 amperes
79,000 RMS amperes momentary (5 cycle)
47,000 avg. RMS amps, 4-second duration
20° C rise on Heat-run
Available: 15-69KV, 2000-4000 amperes
(69KV, 2000 ampere shown)

All component parts of USCO switches are designed and manufactured in our factory. Your inquiries will receive prompt and courteous attention. For full details write to us today.

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama • Phone LYric 2-7241

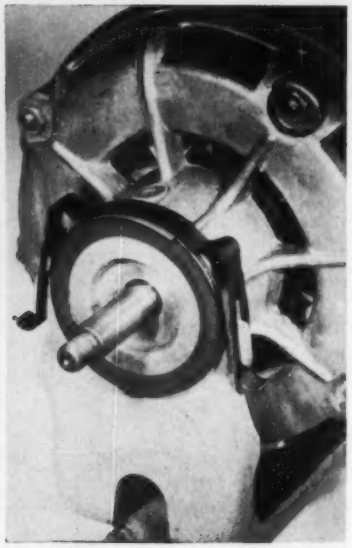
Designers and Manufacturers of High Voltage Electrical Equipment for Utilities, Cooperatives and Industry.

'T' Bar Long Span

(*Continued from page* 182)

metal trough for the support and protection of instrument tubing. The "T" bar is 3-in. by 3-in. galvanized steel, 20 ft long, and slotted every 12 in. to permit bolting to the bottom of the trough. This stiffens the trough and reportedly increases the maximum unsupported span length to 20 ft. The "T" bars are supplied with nuts, bolts and washers.

Instrof Corp, Collegeville, Pa.



Motor Mounting Bracket

This snap-on motor mounting bracket is said to provide 4-point holding power. The manufacturer lists the following as some of its advantages: torque-resistant, great holding power, less production cost, fewer parts to assemble and simplicity of design.

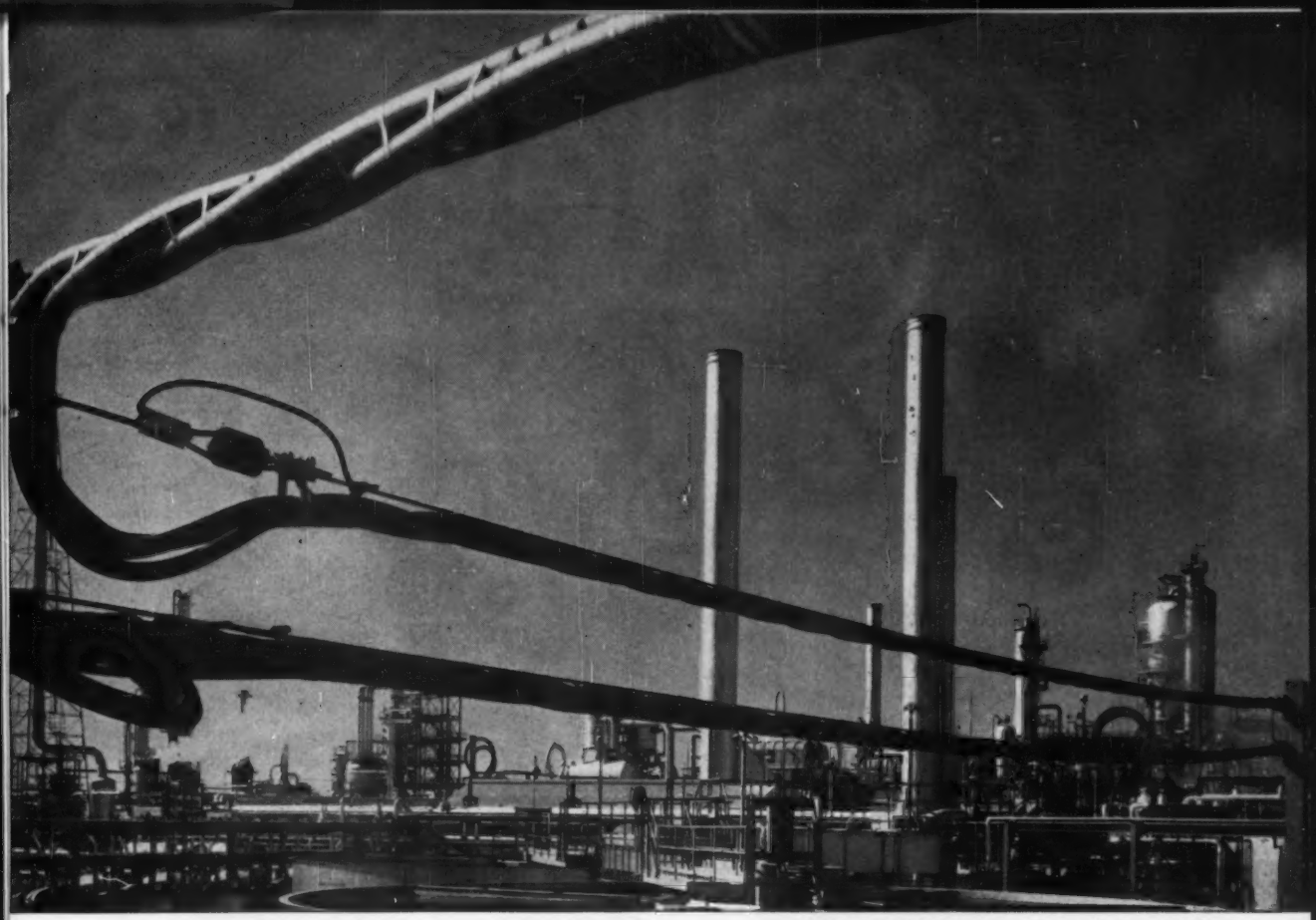
Once snapped in place by a screw driver or similar hand tool, it reportedly is self-retaining, and requires no further adjustment. Literature available.

Prestole Corp
1345 Miami Street, Toledo 5, Ohio

Circuit Breaker Enclosure

A sequence bussed "Stab-lok" enclosure has been designed to provide more 2-pole circuits. Designated No.

(*Continued on page* 186)



Anaconda 15 kv aerial cable installed at oil refinery.

New high-voltage cable cracks the ozone barrier

SAMPLES of Type AB insulated cable bent in small circles are placed in ozone chamber for ozone-resistance test.

Butyl insulation in Anaconda Cable exceeds ozone-resistance test requirements by 2400%

Under high electric stress, minute particles of air break down, form corona. This generates ozone which may combine with the rubber hydrocarbon of the insulation. Without superior ozone resistance, the insulation fails.

But now you can get extra protection against ozone—and ozone damage—with Anaconda Type AB butyl-insulated cable. This insulation is compounded for *inherent* ozone resistance along with other desirable properties.

In standard ozone-chamber test, Type AB insulation (after aging) shows no injury after 72 hours in 0.025-0.030% ozone concentration . . . 24 times longer than required by oil base and butyl specifications.

New Engineering Bulletin EB-27 gives full details on performance of Type AB insulation in 15 Industry Specification Tests. See the Man from Anaconda or write: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. 86297

SEE THE MAN FROM ANACONDA®

pioneer in BUTYL INSULATION

"I want a dependable automatic oscillograph that will locate faults quickly for continuity of service."
"I want an automatic oscillograph designed exclusively for the power utility field."

The answer for both MANAGEMENT and ENGINEERS

The Hathaway RS-9 *Fourteen* or RS-9 *Thirty*

Cut outages—2 millisecond starting insures complete record.

Maintain and adjust easily through hinged panels.

Designed for your switchboard—Projects only 8 inches.

Adaptable to your needs by use of the widest range of galvanometers and accessories.

Save time with front panel control and accurately calibrated viewing screen.

Fast and constant operation—Guaranteed by relay control and automatic lamp replacement.

You can benefit from the outstanding performance of these instruments as do utilities throughout the world. Experienced Hathaway engineers can help analyze your needs.

Write for Bulletins 1-20B and 1-21B.

HATHAWAY INSTRUMENT DIVISION
HAMILTON WATCH COMPANY

1315 SOUTH CLARKSON STREET • DENVER 10, COLORADO

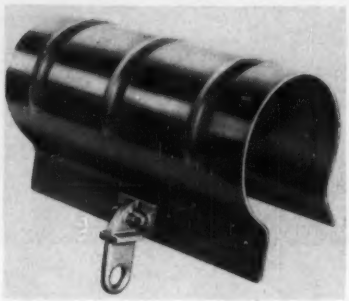
• NEW YORK 630 Fifth Ave. Plaza 7-7947 • CHICAGO 35 E. Wacker Dr. State 2-8411 • DENVER 1315 S. Clarkson St. Spruce 7-2090 • DETROIT 1960 E. Lincoln Ave. Birmingham, Mich. Midwest 4-9004 • PASADENA 380 E. Green St. Ryan 1-7839 • ALBUQUERQUE 3221 Silver Ave., S.E. 5-9632

Circuit Breaker Enclosure

(*Continued from page* 184)

1620, the new enclosure features 100-amp main bus lugs, sequence bussing for six two-pole common trip circuit breakers, twelve 1 in. NA or twelve ½ in. NC breakers. "Step-type" neutral lug provides two positions for No. 14 to 1/0; two positions for No. 14 to No. 6, and ten positions for No. 14 to No. 8 conductors. No. 1620 will take double-pole, common-trip 2 in. Stab-lok type NA breakers rated at 15 to 50 amp; single pole 1 in. type NA breakers for 15 to 50 amp; and single pole ½ in. type NC breakers for 15 and 20-amp branch circuits.

Federal Pacific Electric Co
50 Paris Street, Newark 1, N. J.



Conductor-Hood Splice

This conductor hood-splice fits over two of the manufacturer's conductor hoods, locking them end to end. In this way, two separate 4-ft-long hoods are combined to obtain eight feet of conductor coverage. Made of Formica for insulation safety and durability, the splice is said to be easily applied with a grip-all stick.

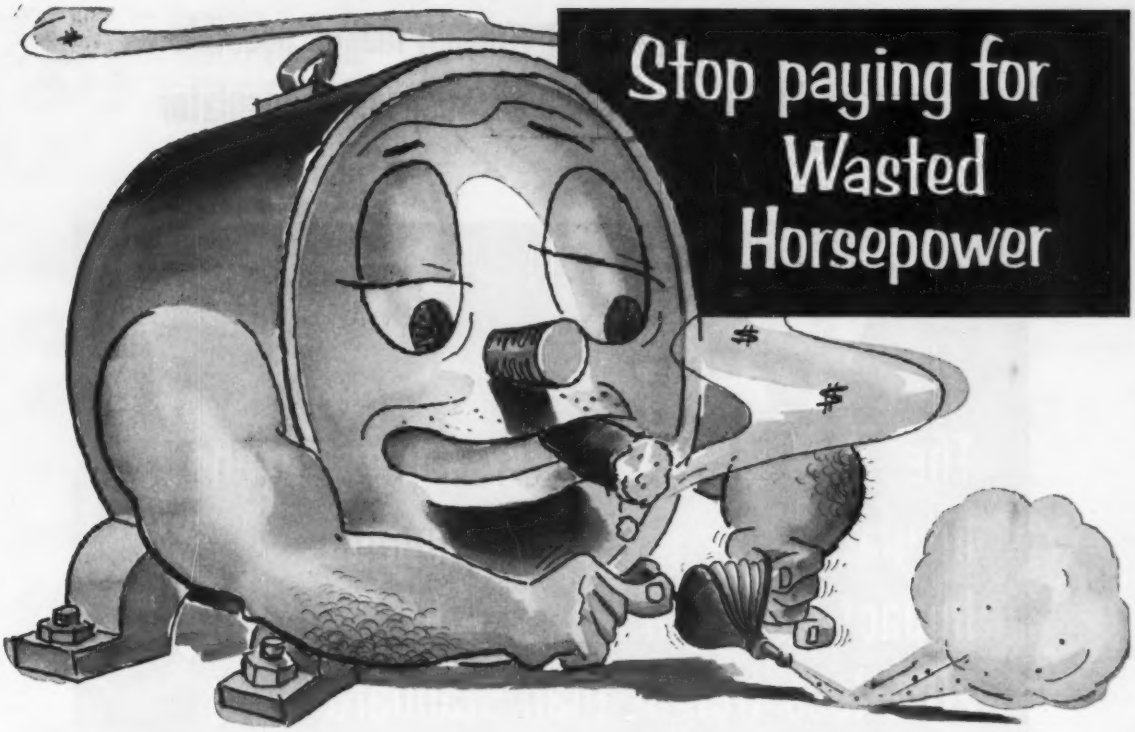
A. B. Chance Co, Centralia, Mo.

Mica Dielectrics

ISOMICA and capacitor-grade SAMICA, two dielectrics, have been developed as replacements for hard to get natural mica films. They reportedly are finding uses in filter and pf-correction capacitor applications.

Capacitor-grade Samica is specially refined continuous mica sheet which, impregnated with high temperature silicone resin, becomes capacitor-grade Isomica. Samica is available in

(*Continued on page* 190)



Just match your average load . . . let silicones carry the overloads

If you specify horsepower to equal "peak overloads," your motors work at full rated capacity only part of the time — you're paying for unused horsepower. Today, silicone insulation has outmoded this kind of wasteful over-motoring. Motors insulated with Dow Corning Silicones have a service factor of 25 to 50% . . . so now you can merely match your average load, and let this *built-in* service factor handle intermittent overloads.

Lower your motor costs! For every dollar wasted on unused motor capacity, you spend an additional $3 for starters, cable, transformer capacity and installation. Silicone insulated motors *save* you real money!

Boost your production! Motors insulated with Dow Corning Silicones have much greater resistance to heat, moisture, and corrosive atmospheres . . . assure *more continuous production.*

Remember, over-motoring is outmoded

Get sources for silicone insulated equipment—mail coupon today

Dow Corning Corporation, Dept. 4412, Midland, Mich.

Please send me sources for Silicone insulated
☐ Motor ☐ Transformers ☐ and Reprint
"New Developments in Silicone Insulation."

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

Here's more proof for you...

The Philip Sporn plant on the American Gas and Electric System installed its first silicone insulated motor over 6 years ago . . . a 1000 hp, 1190 rpm forced draft fan motor built by the Elliott Co. Smaller and less costly to install than an equivalent 1500 hp conventional motor, this unit has been operating in ambient temperatures up to 120 F without a sign of failure to date. Starting against cold air 4 times a day, it is overloaded by 30% bringing its total rise to 250 F with an output of 1300 hp. This kind of dependable performance has led American Gas and many other leading utilities to standardize on silicone insulated auxiliary motors.

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT
LOS ANGELES • NEW YORK • WASHINGTON, D. C. (Silver Spring, Md.)

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

General Electric's new, stronger porcelain makes possible a brand new 25,000 lb† Ball & Socket Suspension Insulator

The XHS Extra High Strength Insulator now gives you doubled Impact Strength...choice of 3 spacings... 20% less weight than standard units.

Increased Leakage Distance in given String Length

Choice of 3 spacings gives wide range of application, unavailable until now in an insulator of this strength. You may increase leakage distance in a given string length or reduce the length of insulator strings without sacrificing insulators.

Increased Strength per Unit Weight

3 lbs. lighter than standard 25,000 lb. units. This 20% weight reduction makes XHS insulators easier to transport and handle, greatly facilitates hot line maintenance work.

Impact Strength is Highest of all Suspension Insulators

Compare the XHS insulator's rated impact strength of 120 inch lbs. with the strength of ordinary 25,000 lb. insulators. You gain by extraordinary resistance to damage in handling, during erection or from malicious motivation.

CHARACTERISTIC DATA, XHS INSULATOR

Locke Catalog Number	Spacing Inches	Dry Arcing Distance
18250	4¾	7⅜
18251	5	7⅜
18252	5¾	7½

DESIGN DATA	XHS	Present EEI-NEMA Std. 52-5
Diameter, Inches	10	10
Max. Recomm. Working Load, Lbs.	12,500	12,500
Impact Strength, In. Lbs.	120	60
Leakage Distance, Inches	11½	11
Radio Influence Voltage Test KV, RMS to Ground	10	10
Max. Microvolt at 1000 KC	50	50
Approx. Net Weight, Lbs.	12	15

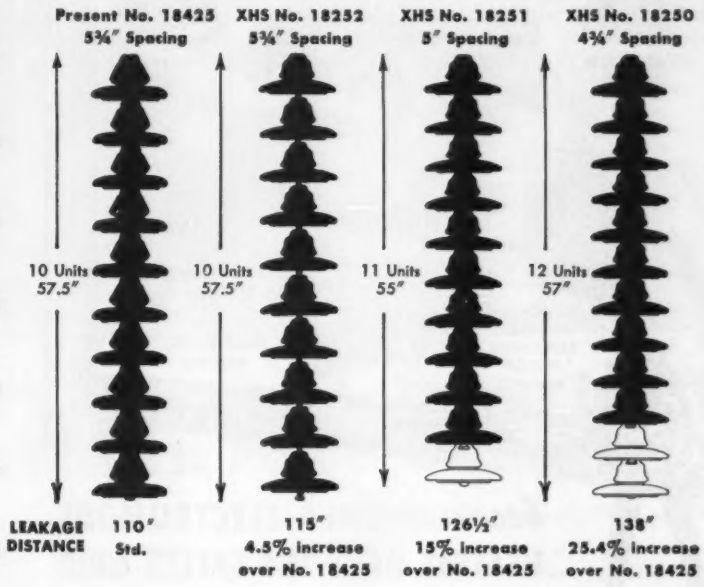
STRING DATA OF No. 18251, 5″ SPACING

Number of Units	Low Frequency Flashover		Impulse Flashover 1½ x 40 MS Wave	
	Dry KV.	Wet KV	Pos KV	Neg KV
4	250	155	420	395
6	345	225	570	535
8	440	295	720	680
10	530	365	865	840
12	615	435	1010	995
14	700	500	1155	1150
16	785	565	1295	1310

† Mechanical and electrical strength

Photo shows how 14 ordinary 25,000 lb. insulators (Locke* 18425, right) are replaced by 17 XHS insulators, 4¾" spaced (Locke* 18250, left). XHS string has 41.5" more leakage distance, is 6 lbs. lighter.

Note how choice of 3 spacings increases leakage distance in same length



With this ceramic improvement, General Electric offers you two new high strength insulators—the UHS, 36,000 lb. M & E (for use on dead-end towers, bundled conductors, etc.) and the XHS (for application wherever 25,000 lb. insulators are now used). Get the facts on both—then decide how they best suit your particular requirement. See your General Electric Insulator representative or write for Information Bulletins to Insulator Department, General Electric Company, Baltimore 3, Maryland.

* Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

because ONLY ELECTROMODE HEATERS HAVE THE SAFETY GRID

This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

because ELECTROMODE LEADS IN ELECTRIC HEATING

ELECTROMODE
Division Of
COMMERCIAL CONTROLS CORPORATION

For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

MAIL COUPON TODAY

MAIL COUPON! Please send your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

ELECTROMODE Division
Commercial Controls Corporation
Dept. EW-126, 45 Crouch Street, Rochester 3, N. Y.
We are interested in ☐ Home ☐ Industrial ☐ Farm
Name.....
Address.....
City.....Zone.....State.....

Mica Dielectrics

(*Continued from page* 186)

0.0015 and 0.002 in. thicknesses in continuous rolls 37 in. wide. Isomica is available in the same thicknesses in sheets 36 x 36 in.
Mica Insulator Co
Schenectady, N. Y.

Utility Truck

The key to the over-all engineering advances in this 4-wheel-drive FC-150 truck is said to be the location of the cab well forward of the engine. This "forward control", as the manufacturer calls it, reportedly allows maximum usage of the vehicle's 81-in. wheelbase, and places the driver in the best position for visibility and control.

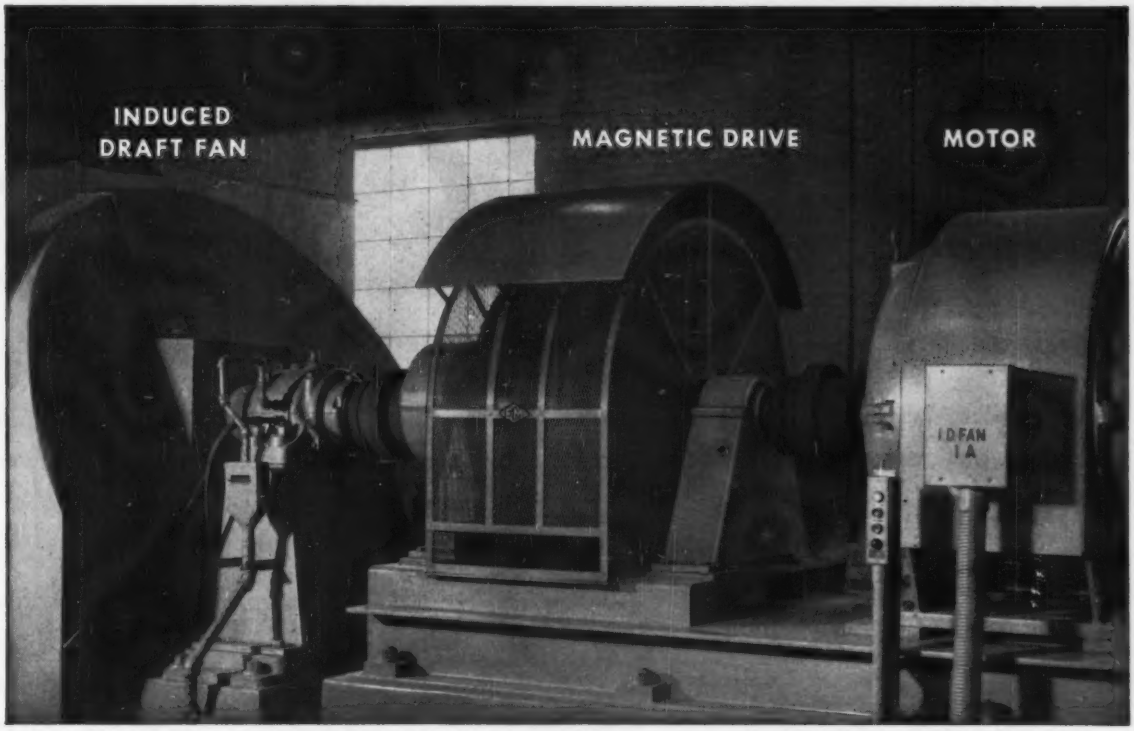
The 4-wheel drive is designed for use across rugged terrain; for highway driving, the truck can be shifted into a conventional 2-wheel drive. With tail gate open, cargo length is 92 in.
Willys Motors, Inc, Toledo 1, Ohio

More New Products

Colorescent Lighting Corp, 914 Westfield Ave, Elizabeth, N. J., has a **light source** under the copyright name of "Tepid Cathode" that they claim will operate satisfactorily from either hot cathode slim or cold cathode lighting circuits.

Monitor Controller Automatic, Rockland, Mass., offer an **overload relay** that is said to provide motor protection regardless of installation characteristics and ambient temperatures.

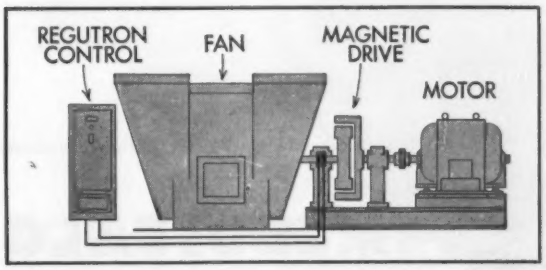
(*More New Products on page* 194)



Now 20 E-M Magnetic Drives for Potomac Electric Power Company

● The clean, compact E-M Magnetic Drive above gives adjustable speed for an induced draft fan at the Potomac Electric Power Company Buzzard Point plant, Washington, D.C. This Drive is rated at 550 hp, 850/90 rpm. The first Magnetic Drives were installed by this large, rapidly growing utility in 1941.

These E-M Magnetic Drives transmit torque electromagnetically from constant-speed a-c drive motors to vary the speed of the fans. The Magnetic Drive responds precisely to the speed dictated by the automatic combustion control.



E-M MAGNETIC DRIVE SYSTEM for induced draft fan speed control consists of a constant-speed motor, the Magnetic Drive, and the E-M "Regutron" Speed Control. Operating speed of the "magnet" coupled to the fan shaft is held at the desired value by the "Regutron" which supplies d-c excitation to the "magnet" in accordance with the demands of the combustion control system.

Among the advantages of Magnetic Drive speed control you will find:

1. **Savings in Driving Power.** Because fan operating speed is no more than required, drive power is used most sparingly.

2. **Reduced Blade Erosion.** When boiler load is reduced and fan speed is reduced accordingly, "sand blasting" effect on the blades by airborne particles is reduced to a minimum.

3. **Precise Control of Air Flow.** The E-M Magnetic Drive maintains fan speed to within plus or minus *one-half percent!*

4. **Easy and Economical Maintenance.** The Drive and its control contain few moving parts. It is simple to understand and requires little maintenance. No auxiliary cooling equipment needed.

Ask your nearest E-M sales engineer for more facts and figures on this simple, economical method of driving draft fans. And write the factory for E-M Publication No. 1107 containing pictures and data on typical Magnetic Drive applications.

ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

4400-TPA-2151

E-M

Magnetic Drives **MAKE DRAFT FANS DO EXACTLY WHAT YOU WANT THEM TO**

NEW!

"BUFFALO"

a new high

MOST STREAMLINED INLET — note smooth inlet bell matching the deep drawn wheel flange to form a "true half circle" inlet into wheel.

DEEPER BLADES FOR DEEPER "BITE" — note exceptionally deep blade design in photo below. This improves air flow thru blade channels. Flanged hubs—smoothly curved for best air entry conditions.

The wheel has been dynamically tested in the "Buffalo" Vacuum Pit — possible only at "Buffalo". By spinning various rotor designs to destruction the optimum wheel construction was determined — another "Buffalo" "Q" factor.*

"Buffalo" Air Foil Wheel. Note "deep-bite" blades for most efficient air handling.

**The "Q" Factor — the*

BUFFALO

BUFFALO,

Canadian Blower &

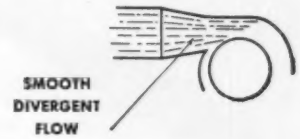
VENTILATING AIR CLEANING AIR TEMPERING PRESSURE BLOWING

"Deep Blade" AIR FOIL FANS

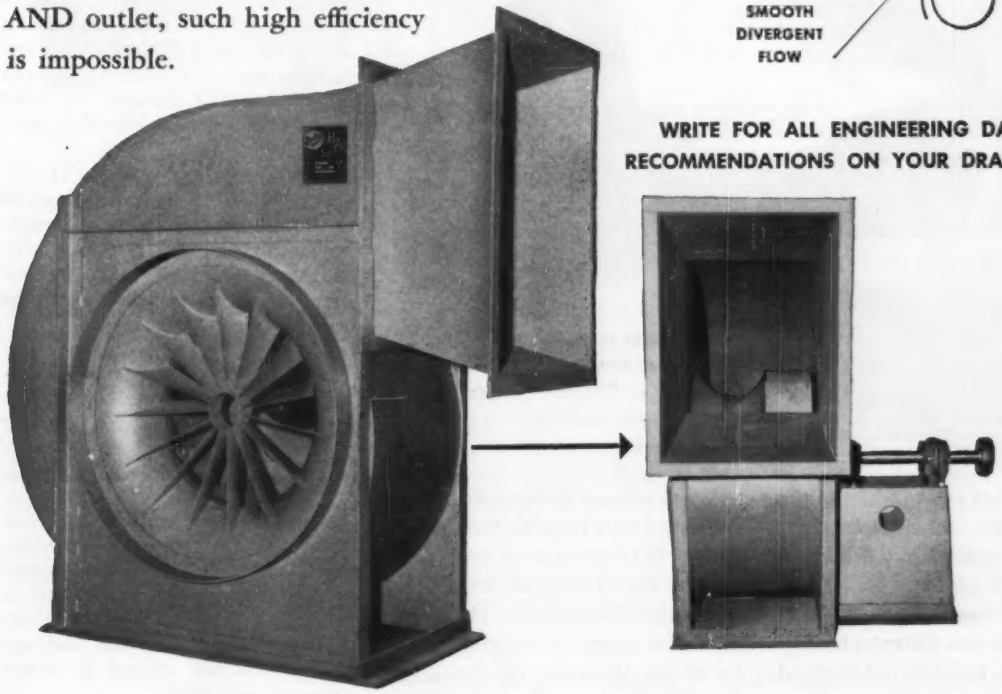
in forced draft performance

IMPROVED FAN OUTLET — reduces outlet air turbulence from fan cutoff into duct by making more even, gradual change from velocity to static pressure. Without this complete streamlining of inlet, housing AND outlet, such high efficiency is impossible.

92% MECHANICAL EFFICIENCY — not an inflated claim, but proved performance you can expect in field operation.



WRITE FOR ALL ENGINEERING DATA AND RECOMMENDATIONS ON YOUR DRAFT PROBLEM



built-in Quality which provides trouble-free satisfaction and long life.

FORGE COMPANY

"Buffalo"

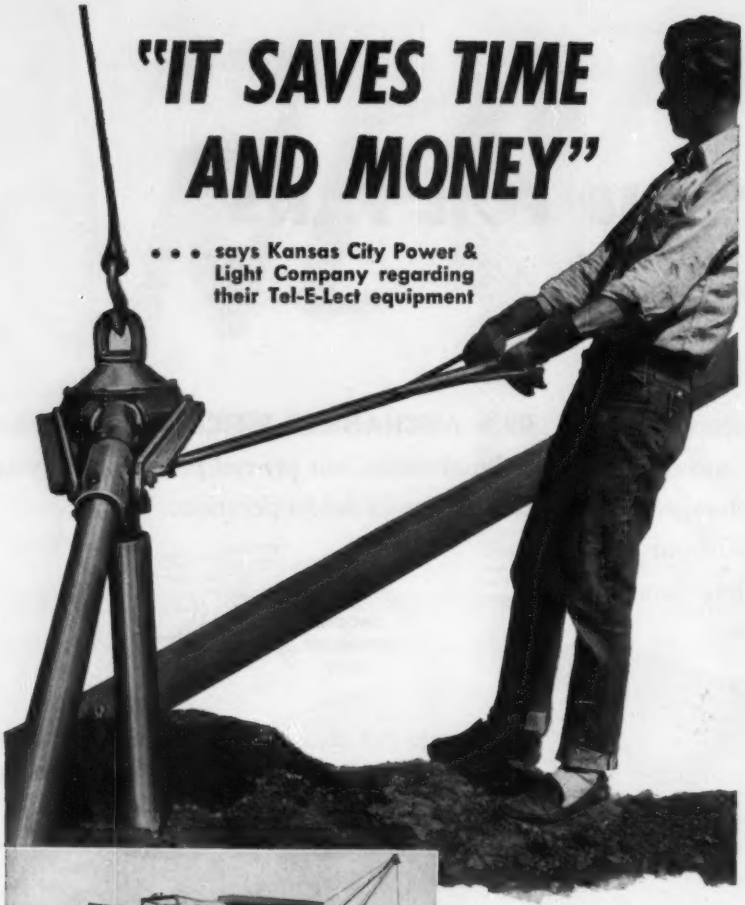
NEW YORK

Forge Co., Ltd., Kitchener, Ont.

INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING

"IT SAVES TIME AND MONEY"

• • • says Kansas City Power & Light Company regarding their Tel-E-Lect equipment



Takes only a two-man crew — one man in the cab and one man on the auger.

There's a lot of action when trucks mounted with Tel-E-Lect equipment go to work for the Kansas City Power & Light Co. of Kansas City, Mo. These pictures, taken at the site of the new Farmers Underwriters Assn. building in Overland Park, Kan., show the Power Company installing lines for 3 phase power. The holes being dug vary from 6½′ to 10′ deep. The company particularly likes the fact that the Tel-E-Lect digger unit is detachable from the truck, a big convenience feature.

What you see in operation here is Tel-E-Lect's Popular Model 350 digger that permits a two-man crew to dig a hole and set a pole in less than five minutes. Here you have low speed for digging, high speed for throwing off the dirt. For more information about the wide range of Tel-E-Lect equipment for utility trucks, write for a complete line bulletin.

There's a Tel-E-Lect service-dealer near you!

TEL-E-LECT

10003 Minnetonka Blvd.
Minneapolis 26, Minn.
PRODUCTS, INC.

More New Products

(*Continued from page* 190)

Robertshaw-Fulton Controls Co, Fielden Instrument Division, 2930 N. Fourth Street, Philadelphia 33, Pa., has developed a **"P-E-P Transmission System,"** that reportedly allows mechanical and pneumatic signals to be converted to dc for long range transmission and then be reconverted to pneumatic pressure for actuating control valves or other equipment.

General Electric Co, Syracuse, N. Y., is producing a series of miniature 10-kw **silicon rectifiers** that are said to be capable of operation in an ambient temperature range of from —65 to 200 F.

Devcon Corp, Danvers, Mass., offers **"Devcon,"** a combination of 80% steel and 20% plastic used in repairing broken machinery. It is said to be as easy to mold as clay, and hardens into a steel-like mass that can be sawed, drilled, threaded or ground with conventional metal-working tools.

Wayne Mfg Co, Pomona, Calif., has an **electric power sweeper** which is said to be able to work an 8-hr shift without recharging. It features a built-in battery charger, 3-speed forward and 1-speed reverse transmission, and a large hopper capacity.

Magtrol, Inc, Buffalo, N. Y. features a complete line of **motor testing dynamometers** with electronic tachometers. Seven torque ranges from 0.5 to 750 ounce-in are available.

International Instruments, Inc, New Haven, Conn., have a line of miniature, expanded-scale **ac voltmeters.** Ranges available cover from 80 to 140 volts. Applications include X-ray machines, TV cameras and other apparatus seriously affected by variations in line voltage.

Pierce Renewable Fuse Co, Inc, Leicester, N. Y., have a line of **knife blade fuses** with replaceable links that are said to save delays and reduce downtime.

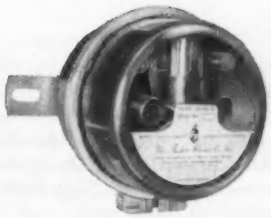
Lightolier Co, 346 Claremont Ave, Jersey City, N. J., feature a drum-shaped **diffuser-fixture** that is said to provide glareless lighting.

(*More New Products on page* 198)

IN FISHER-PIERCE
PHOTOELECTRIC LIGHTING CONTROLS

Lighting engineers who have specified F-P controls for installations know that a basic reason for the highly dependable operation of these controls is their carefully engineered *protection* against surge voltages, transients and lightning. Here are specific examples: components are spaced to withstand a *minimum* of 3000 volts RMS between any circuit point and grounded case, without breakdown; F-P tests to *5000* volts; basic insulation level as high as 7500 volts without arrestor . . . control circuit and load can both be fused against transients and surges . . . design provides fail-safe operation, so that controlled load remains on or becomes energized in the event of any functional failure . . . transformer is the type which isolates the supply voltage from the control circuit . . . components are all operated well below maximum ratings . . . the load relays used in F-P controls will handle an inrush current ten times the steady state current . . . larger controls can be equipped with accessory lightning arrestors. Protective design features like these pay off in lower installation *and* operating costs. And *only* F-P controls combine such protection with these four other important features:

64400



63300C

COMPONENT QUALITY . . . Pre-aged, long life tubes. Wire wound potentiometer. Metal encased and ceramic capacitors. Non-hygroscopic 1P39 phototube. Balanced armature Sigma sensitive relay.

DESIGN ADVANTAGES . . . Can be installed, serviced or removed safely and easily. Wide mounting versatility and orientation *after* bracket installation.

ADAPTABILITY . . . Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY . . . Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Fisher-Pierce Bulletins, available upon request, give complete specifications and operating data.

THE FISHER-PIERCE CO., INC.
82 Pearl Street, So. Braintree, Boston 85, Mass.

DOW *At the end of the line a town waits... in darkness*

Keep repair crews from

Restoring service on a stormy night is work enough. Repair teams will make better time if they don't have to fight their way through a jungle of brush and weeds to the scene of trouble.

Chemical control of weeds and brush keeps the right-of-way clear. Repairmen work safely, swiftly . . . outage time is reduced. You save valuable hours of manpower and service.

SPECIAL CHEMICALS FOR SPECIAL PROBLEMS

Results from Dow brush and weed killers are neater, faster, longer lasting than cutting. Each chemical is designed to do a special job. Esteron® 245, Kuron® and Esteron Brush Killer knock out brush and tree species. They combine hard-hitting killing power with low volatility and low toxicity. *Radapon**, containing dalapon sodium salt, gives you season-long control of grass. Works through leaves but kills roots, too. For control of both broad-and narrow leaved weeds, use Baron®. A semisterilant, it keeps substations, storage areas and plant sites weedfree.

Dow weed and brush killers are the effective, low-cost way

tangling with trouble...

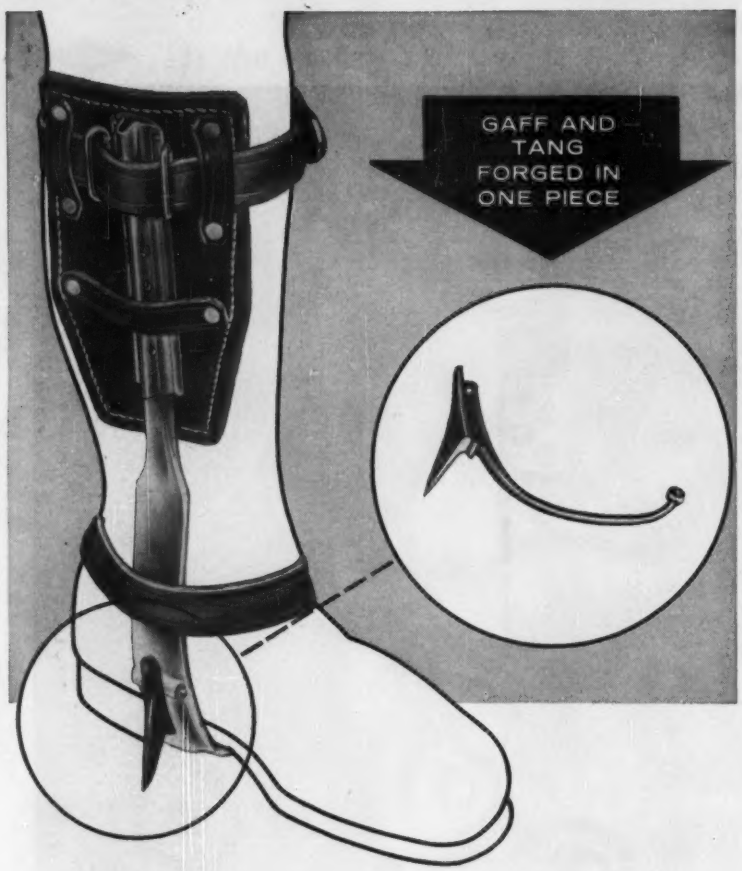
to a clean right-of-way. Your own crew can apply these easy-to-apply chemicals. We'll be glad to send cost figures showing how other people saved money using Dow selective herbicides. Write THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemical Sales Department, Midland, Michigan.

USE DOW WEED AND BRUSH KILLERS

*Trademark of The Dow Chemical Company

you can depend on DOW AGRICULTURAL CHEMICALS

DOW



Here's why M-S-A–Brooks Adjustable Climbers provide greater safety–durability

Gaff and tang forged in one piece! That's a statement that makes plenty of safety-sense to workers who depend on a small "tooth" of steel to support their weight high above the ground. This feature is exclusive with the M-S-A–Brooks Adjustable Climbers. And there's more to the story. The gaffs and leg irons are forged from high quality, medium carbon steel, heat treated to assure the proper balance of hardness, toughness and ductility.

Inspection plays an important role, too. Every leg iron and gaff is examined by the magnetic particles method. Statistical sampling is used for impact, absorption, Rockwell hardness and metallurgical tests. And all this means greater safety, longer wearing qualities . . . less maintenance.

Pads and straps are made of top grain steer hide with chrome leather reinforcement on the leg side of the calf pad. The result—maximum comfort on the job.

Write for complete details.

M-S-A
SAFETY EQUIPMENT HEADQUARTERS

Call the M-S-A man on your every safety problem . . . his job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S. • Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

More New Products

(*Continued from page* 194)

Emerson & Cuming, Inc, Canton, Mass., have an epoxide **casting resin** called "Stycast 2741." Supplied as two components, the material is said to cure easily at room temperature. Shrinkage during curing is negligible, according to manufacturer, and adhesion to most materials is said to be very satisfactory.

Furnas Electric Co, Batavia, Ill., manufactures a **low-pressure cut-off switch** for water system protection, that stops pump operation when water pressure falls below a safe, predetermined operating level.

Pattern Products Co, Union, N. J., have available a **fluorescent tube changer** which is said to make the changing of tubes safer, easier, and more economical.

Arrow-Hart & Hegeman Electric Co, Hartford, Conn., offers a 3-wire, 50-amp, 250-volt polarized 90-deg **angle cap** for flush or surface outlets.

Metal & Thermit Corp, 100 Park Ave, New York 17, N. Y., has introduced a **vinyl maintenance coating**—Ucilon Coating 1400—that is said to provide corrosion resistance of previous vinyl based coatings.

Bristol Co, Waterbury 20, Conn., make portable, self-contained **pH measuring and recording instruments** that require no external power supply. They are for stream pollution, waste-treatment plant effluent, and industrial water supplies.

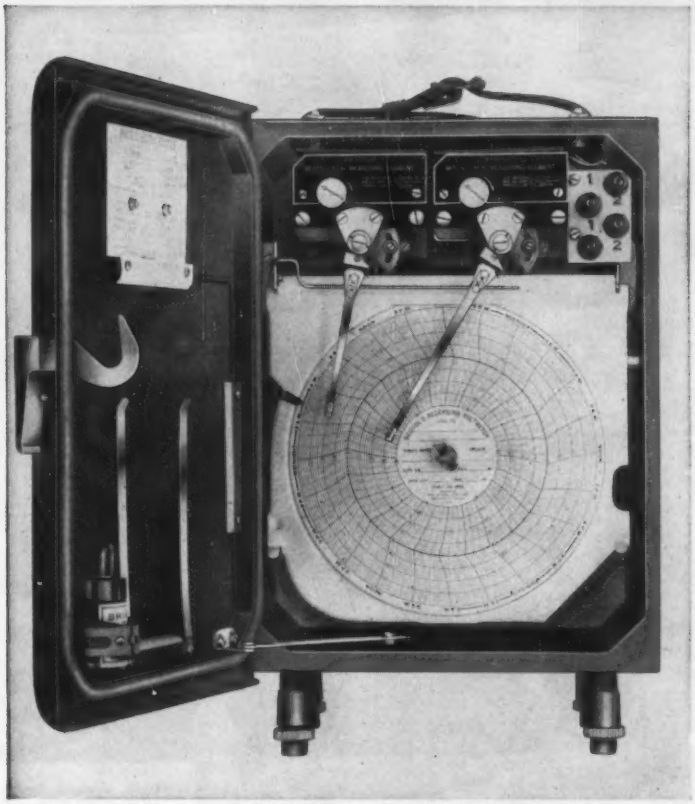
B. A. Wesche Electric Co, 1622 Vine Street, Cincinnati 10, Ohio, have developed three compact **torque-brake units** that are said to have a wide range of speed-torque characteristics.

Electric Control Products Co, 6808 Wade Park Ave, Cleveland 3, Ohio, have developed a **wire marking system** employing letters, numbers, or a combination of both for coding thermoplastic wires.

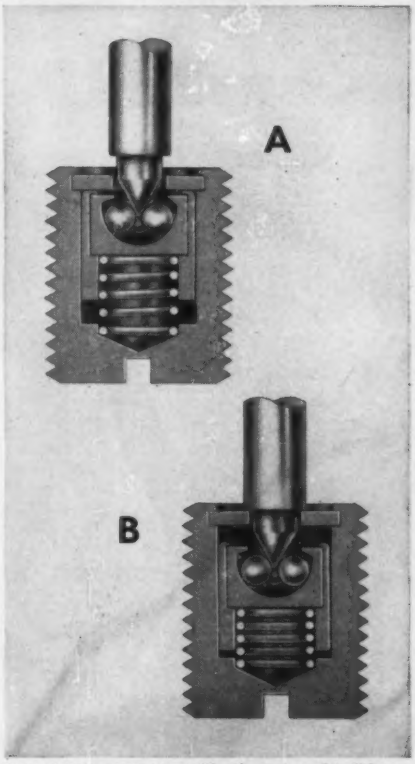
GMC Truck & Coach Division of General Motors Corp, 660 S. Blvd, East, Pontiac 11, Mich., has a **highway tractor** with air suspension, aluminum construction features and a turbo-charged diesel engine.

New! Two-pen Voltmeter

Two rugged reliable moving-iron elements provide independent records to ±1% on single chart: Similar two-pen ammeter available



BRISTOL'S® TWO-PEN VOLTMETER. Portable (*shown*) is ideal for on-the-spot checks requiring two simultaneous voltage records. Also available for portable and pole mounting use and for permanent installations.



SHOCKPROOF BEARINGS. Shock-mounted ball bearings support pivots at front and rear of the rugged moving-iron measuring element. In normal use (A) spring holds bearings against pivot. Under mechanical shock (B) spring absorbs impact.

Here's the ideal instrument for on-the-spot simultaneous records of two a-c voltages—either related or independent.

Bristol's new two-pen voltmeter has the same rugged moving-iron measuring elements as Bristol's standard electrical instruments. But there are *two* elements with *two* pens, providing *two* independent records on a two-zone chart!

The new voltmeter provides easy-to-read visual records and is valuable for such uses as checking the balance on single-phase three-wire systems and for visualizing voltage regulation. Available for portable, portable and pole mounting or for wall, switchboard, or flush-panel mounting. Two-pen ammeter model is ideal for portable use with split-core current transformers.

Here are some outstanding features of this new Bristol instrument:

High accuracy—±1% of full scale.

Two high-torque moving-iron mechanisms—Bristol's moving-iron mechanism produces greatest torque possible while keeping weight and power drain to a minimum. Assures positive recording over full range.

Low electrical burden—Only 5.5 volt-amperes at 120 volts or 12 volt-amperes at 240 volts for each voltmeter mechanism. Only 5 volt-amperes at 5 or 10 amps for ammeter.

High stability of calibration—Bristol's moving-iron mechanism is inherently stable, seldom requires calibration.

Easy calibration in field—Recalibration, if necessary, is easily accomplished by user without special tools or skills.

Rugged construction includes shockproof bearings, locking device to prevent pen movement in shipping or while carrying portable models.

Leveling not critical.

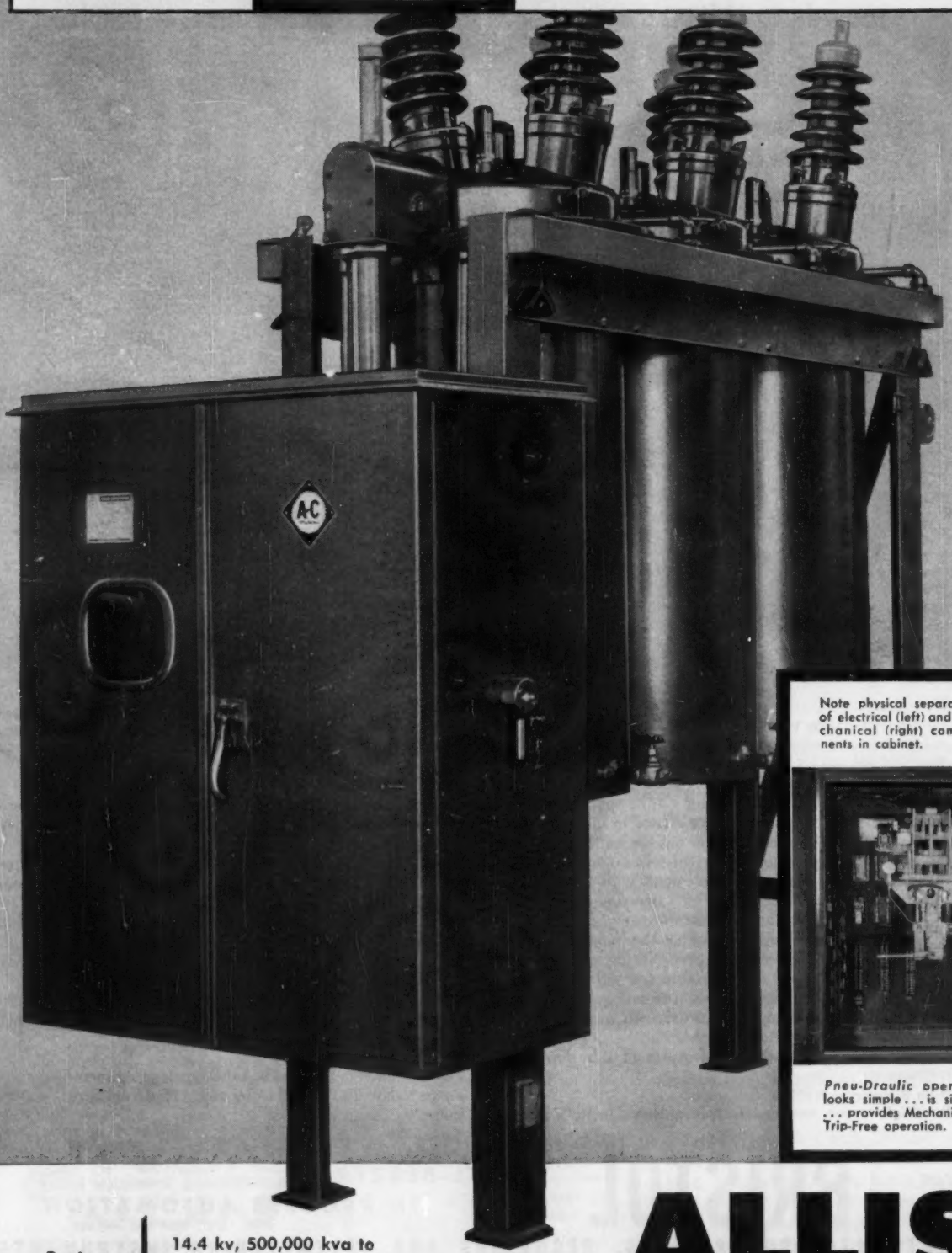
Write for complete data on this outstanding recording voltmeter today. The Bristol Company, 116 Bristol Road, Waterbury 20, Connecticut. 6.27

BRISTOL

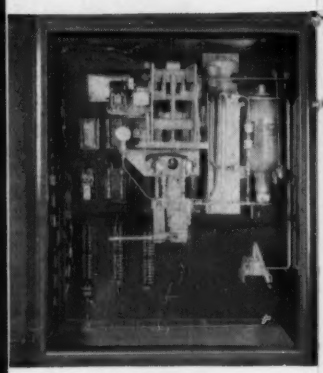
TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

You get MORE when it's Built by



Note physical separation of electrical (left) and mechanical (right) components in cabinet.



Pneu-Draulic operator looks simple . . . is simple . . . provides Mechanically Trip-Free operation.

Ratings: 14.4 kv, 500,000 kva to 69 kv, 3,500,000 kva

ALLIS-

ALLIS-CHALMERS

NEW

frame-type Allis-Chalmers

BREAKER

Completely Redesigned from Top to Bottom for MORE Accessibility

Here are some of the many features of this new breaker:

- Low maintenance, due to:
  a) Simplified external adjustment of overtravel stop . . . no feeler gauges required.
  b) Single lift rod guide (in place of two) for greater accessibility to pole unit mechanism.
  c) Only four bolts hold tank to frame . . . simplifies lowering.
  d) Cabinet built shallow for easy access.
- No tank liner required.
- High efficiency oil-gas separator.
- AEIC standard wiring *plus* ASA standardized bushings.
- 100% Mechanically Trip-Free — like all Allis-Chalmers breakers.
- Available with *Pneu-Draulic*, pneumatic or solenoid operator.

For the rest of the story, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-5011

Ball-type position indicator on top of breaker visible from 360 degrees.

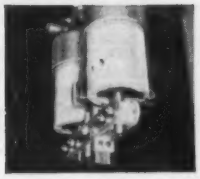
Side trip provides accessibility — *plus* provision for padlocking.

Sampling oil is drawn from the working area of breaker tank.

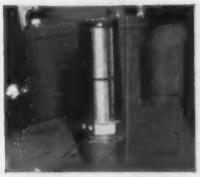
Smooth fabricated steel top for each tank — free from crevices or ridges.

Operator cabinet is low to foundation level for easy access to interior.

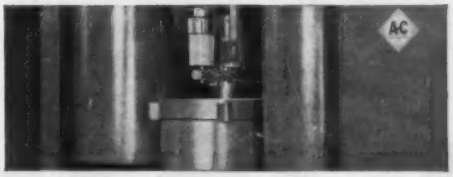
CT lead ducts eliminate conduit—have removable bottom plates for full-length access.



Turbo Ruptor device has threaded pot for easy removal . . . self-aligning tulip and bayonet contacts.



Float-type oil gauge provides more visibility . . . eliminates leakage of sight type gauge.

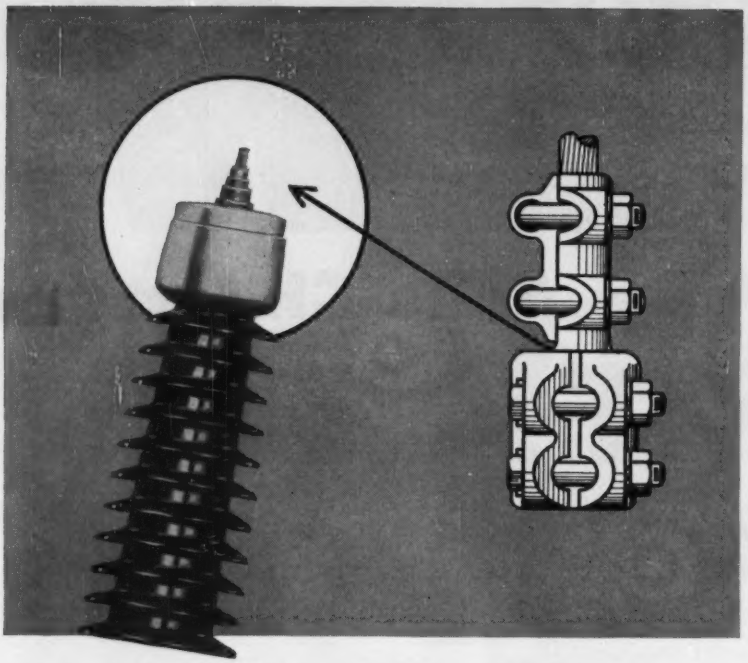


Access to tanks and contacts is unobstructed by frame. Note full tank skirt for stability when lowered.

Pneu-Draulic and *Turbo Ruptor* are Allis-Chalmers trademarks.

CHALMERS

A-C ALLIS-CHALMERS



Will missing stud connectors wreck your schedule?

Too often they're forgotten until a lineman discovers them missing—*on the job*. That can mean days of delay, money lost, and the timing you planned ruined.

Vital links we call them at Royal—like the spark plugs on your car. You want the *finest*, and you want them *on time* . . . with Royal you've got both. Royal stud connectors are high strength copper alloy, designed so that the temperature rise is always less than the conductor. Contact surfaces are finished by grinding, sand blasting and machine brushing (a Royal standard for over 20 years) to provide multiplicity of point contact. Silicon Bronze bolts are standard —big ½" minimum dia. on conductors 500 MCM or ½" IPS tubing and larger and for studs 1⅛" dia. and larger. Royal is *always* on emergency call to deliver stud connectors to you on the shortest notice possible.

FREE HANDBOOK **24 pages, filled with useful information on stud connector selection . . . only book ever published devoted *exclusively* to subject. Make it part of your reference library. No obligation . . . write TODAY.**

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

CATALOGS—BULLETINS

• **MISCELLANEOUS:** The publications listed below were issued recently by the General Electric Co. The address is Schenectady 5, N. Y., unless otherwise indicated:

Small high-current silicon rectifiers are covered in a brochure of application notes, designated ECG-148A. Write Electronics Park, Syracuse, N. Y.

Mercury vapor street lighting is the subject of bulletin No. GEC-1403.

General purpose control, its products and how they work, are explained in GEA-6372.

Two-way radio, 450 mc is covered in ECR-380-A. Address is Communications Dept, Electronics Park, Syracuse, N. Y.

Molded case circuit breakers and their coordination with current-limiting fuses for protecting low-voltage feeder circuits is discussed GEA-6569, available from Circuit Protective Devices Dept, Plainville, Conn.

Industrial lighting systems cost analysis is the subject of "The Lighting Engineer" of October, 1956, issued by the Large Lamp Dept, Nela Park, Cleveland 12, Ohio.

Shaded-pole motors for fan and blower use are covered in GEA-6134A.

TRI/CLAD 55 Motors, 1 to 5 hp drip-proof and enclosed, are the subject of GEA-5980.

Control transformers are covered in GED-2767A.

"Textolite" surfacing material, its patterns and colors available, is illustrated in brochure T-CDL-404 issued by the Chemical & Metallurgical Division, Pittsfield, Mass.

• **CATALOG DIGEST:** A digest of its various catalogs, indexed with their subjects, respective prices, and related information has been published by, and is available from Square D Co, 6060 Rivard Street, Detroit, Mich.

• **WELDING STUDS:** A specification booklet describes the arc welding studs most commonly accepted as standards in the industry. Free, write KSM Products, Inc, Merchantville 8, N. J.

• **GLASS ELECTRICAL TAPES:** The complete line of the manufacturer's glass electrical insulating tapes are described in a bulletin issued by Russell Mfg Co, 102 E. Main Street, Middletown, Conn.

• **CIRCUIT BREAKERS:** A 20-page bulletin describes standardized new types of AB-I enclosed circuit breakers with 600-volt ratings ranging from 15 to 600 amp that are manufactured by Federal Pacific Electric Co, 50 Paris Street, Newark 1, N. J.

• **TRANSFORMERS:** A brochure covers production facilities of Hill Transformer Co, Inc, 1030 Washington Street, San Carlos, Calif.

• **TIME DELAY RELAY:** Bulletin AWH TD403 covers the manufacturer's time delay relay type 6400. Write A. W. Haydon Co, Waterbury, Conn.

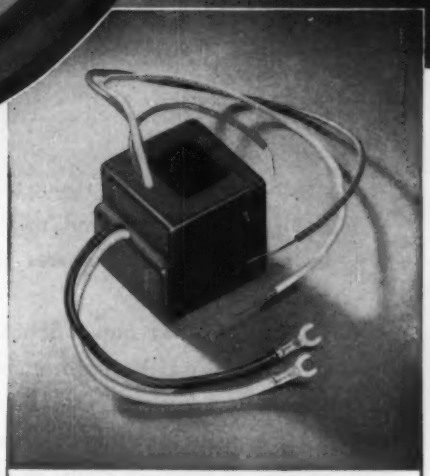
(*More Catalogs on page* 204)

PROVEN ECONOMY BOOSTS USE OF SANGAMO J2T

The high accuracy, low maintenance, and long life of Sangamo J2T singlephase thermal demand-watthour meters set the pace for the greatly increased use of these combination units.

Their fine performance record helped boost total sales of all manufacturers by 16,313 more thermal combinations in 1955 than in 1954.

The J2T is ideally suited for application to singlephase residential and commercial loads. It is supplied with a 24 KW scale to take full advantage of the 100 ampere range of J2 Watthour Meter. It is also available with a 12 KW scale for power companies who measure demands on smaller loads and want indications above ¼ to ⅓ scale.



Better protection from lightning and high voltage surges

The insulation levels of the demand element and the watthour meter element of these combination meters are equally high. The potential transformer coil of the demand element is encapsulated in Sangamo Secolene, a specially developed epoxy resin with extremely high dielectric strength.

Write for more information on these cost-cutting demand meters today.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM56-6

Subox paints are based on suboxide of lead, a most effective anti-corrosive agent. They are the only paints made in America using this chemically-active, finely-dispersed pigment that spreads smoothly, evenly, thoroughly, adheres closely and endures for many years.

Very often two coats of Subox replace three coats of standard paints, and frequently, even one coat is sufficient, especially as Subox* and Subalox* come in many attractive colors and serve as primers as well as finishing coats, or can be applied over conventional primers.

For full information write for the brochure: *"Plan Painting of New Plants to Reduce Costs."*

Subox Inc.

Established 1924 *Trade Mark

3 Fairmont Plant, Hackensack, N. J.

See Catalogues in Sweet's Industrial and Engineering Files

Catalogs—Bulletins

(*Continued on page* 202)

• **ALUMINUM:** A 16-page bulletin lists sizes and weights of rod, bar, sheet, coil, plate, tubular and building products of Reynolds aluminum carried in stock by Joseph T. Ryerson & Son, Inc, Box 484, Jersey City 3, N. J.

• **WATER CONDITIONING:** Two booklets on the Evis Process of Water Conditioning are available by writing to Elvis Mfg Co, 5955 N. Rockwell Street, Chicago 45, Ill.

• **CAPACITORS:** Two pamphlets on capacitors and blocks: No. PC-3 describes the manufacturer's secondary capacitors rated at 3, 5, 7½ and 10 kvar at 240 volts. No. PC-7 is on capacitor blocks rated at 250 to 1,200 kvar at 2,400 to 7,960 volts. Line Material Co, Milwaukee 1. Wisc.

• **PORTABLE ELECTRIC TOOLS:** A 32-page bulletin describes 69 portable electric tools and kits fabricated by Porter-Cable Machine Co, 93 Exchange Street, Syracuse 8, N. Y.

• **SPRAY LUBRICATION:** Bulletin 60-A describes the Farval spray lubrication systems for heavy industrial gearing and slide surfaces. Request from Farvel Corp, 3249 E. 80th Street, Cleveland 4, Ohio.

• **MILLIVOLT RECORDERS:** Data Sheet E-ND46(6) is the designation given the 4-page publication describing the line of speedomax G Millivolt Recorders available from Leeds & Northrup Co., 4934 Stenton Ave, Philadelphia 44, Pa.

• **AIR PURIFICATION:** A brochure on how activated charcoal air purification protects electrical equipment can be obtained free by writing Dept E, Barnebey-Cheney Co, Columbus 19, Ohio.

• **INTERRUPTING SWITCH:** A 4-page folder describes the new "Powerupter" switch made by Delta-Star Electric Division, H. K. Porter Co, 2437 Fulton Street, Chicago 12, Ill.

• **GAS ANALYSIS:** Data and general specifications for their "Gas Master" line of gas analysis instruments has been published by Gow-Mac Instrument Co, 100 Kings Road, Madison, N. J.

• **MOTORS:** A brochure describing their line of Linc-Weld motors has been issued by Lincoln Electric Co, Cleveland 17, Ohio. Ask for SB-1345.

• **LIGHTING PANELS:** Data for lighting engineers and architects on their two Pyrex brand square concave Lenslite (10⅞ and 11¾ in. square) are given in Bulletin L-120-J issued by Corning Glass Works, Corning, N. Y.

• **INSULATION MATERIALS:** "IMC Electrical Insulations Product List" is the name of a booklet which lists alphabetically the various materials used for electrical insulation. Free, write Publications Dept, Insulation Manufacturers Corp, 565 W. Washington Blvd, Chicago 6, Ill.

• **WOOD PRESERVATION:** A complete line of wood preservatives is given in "Wood Preserving Guide" published by Utilities Division of Osmose Wood Preserving Co of America, Inc, Buffalo, N. Y.

• DIESEL ENGINES: Bulletin 108 covers the Superior Model 40, stationary diesel engine line built by White Diesel Engine Division, White Motor Co, Springfield, Ohio.

• MATERIALS PROPERTIES: A comparator chart, listing property values of laminated plastic and vulcanized fibre in a comparison evaluation, has been issued by National Vulcanized Fibre Co, Wilmington 99, Del.

• AUTOTRANSFORMERS: A 23-page booklet describes the line of "Variac" autotransformers manufactured by General Radio Co, Cambridge 39, Mass.

• RESISTORS & SWITCHES: Dimensions, mounting styles, ratings, standard modifications, and performance characteristics for its complete line of variable composition resistors and snap switches are contained in a 30-page bulletin RC-10B published by Stackpole Carbon Co, St. Marys, Pa.

• PLASTICS: To help engineers, designers and fabricators choose the right plastic for any job, a revised 1957 edition of "Condensed Reference File of Bakelite Plastics" has been issued by Bakelite Co, Division of Union Carbide & Carbon Corp, 30 E. 42nd Street, New York 16, N. Y.

• RADIO PARTS: A 72-page booklet catalog devoted entirely to 2-way radio communication parts has been released by Motorola Communications & Electronics, Inc, Factory Parts Department, 589 E. Illinois St, Chicago 11, Ill.

• ELECTRONICS: A 20-page booklet entitled "Electronic Facts Handbook" contains selected reference data useful to people concerned with government and industrial R & D activities. Write PR Dept, American Machine & Foundry Co, 261 Madison Ave, New York 16, N. Y.

• PIGMENTED POLYSTYRENE: A Technical Bulletin describing in detail the series of specially pigmented polystyrenes marketed under EVENGLO polystyrenes has been issued by the Chemical Division of the Koppers Co, Pittsburgh 19, Pa.

• BUSHINGS: A 12-page bulletin describing the manufacturer's line of POC (Paper-Oil Condenser) bushings meeting ASA Standards may be had by writing to Lapp Insulator Co, Inc, LeRoy, N. Y.

• INDICATORS: Specification No. S1001-1 describes the company's 3½-in. concentric dial "Tel-O-Set" indicators, used primarily on graphic panels. Write Minneapolis-Honeywell Regulator Co, Industrial Division, Philadelphia 44, Pa.

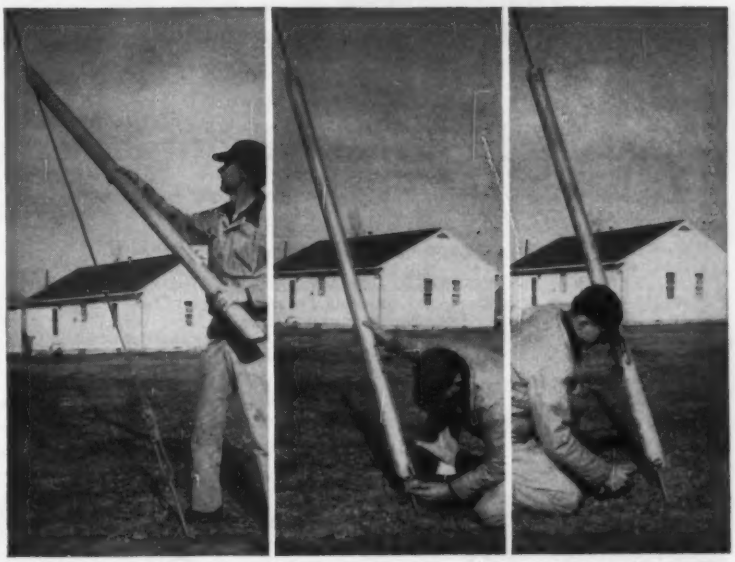
• COMPRESSION CONNECTIONS: Compression connectors of the manufacturer's various types are covered in his Bulletin 13. Mechanical and hydraulic installing tools are also covered. James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.

• COMPRESSORS: Specification sheets on Hermetic Compressors, models 2JF2-2hp, 2JF2-3hp, 2JF3-5hp and 2JF5-7½hp are available from Worthington Corp, Advertising & Sales Dept, Harrison, N. J.

• AERIAL SURVEYS: A brochure indicating the advantages of aerial survey methods in preparing plans and profiles of transmission lines is available from American Aerial Surveys, Inc, 907 Penn Ave, Pittsburgh 22, Pa.

Tighten only 1 easy-to-reach bolt to install the CHANCE MONO-BOLT GUY GUARD

When a groundman installs a Chance Mono-Bolt Guy Guard, he has only three things to do:



1 Slip the flanged hook over the guy wire.

2 Place clamp on anchor rod and slide it into the slot at bottom of guard.

3 Tighten this one bolt at the lower end of the guy guard.

It's that easy—your men don't have to be extra tall—there's no stretching for high bolts to tighten . . . the Mono-Bolt clamp securely grips the anchor rod with a firm 3-point gripping action . . . only a single wrench is needed. Easy installation makes for proper installation.

Heavy gauge steel guard is hot galvanized for long life and high visibility.

Mono-Bolt Guy Guard comes in half or full round construction, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".

CG56-9

A·B·CHANCE CO.

ABC INDUSTRIES

CENTRALIA, MISSOURI • San Francisco, Cal. • Pittsburgh, Penn.

Just the right capacity for line work...

develops 1500 watts; weighs only 125 pounds; 4-cycle engine power

This workman is drilling holes in a cross arm with power from an Onan 105AK. Unit can also be removed from truck and easily carried to where it's needed.

Onan Model 105AK-1P Electric Plant

This power-packed lightweight plant supplies all the power you need for electric drills, saws and other equipment . . . and for floodlighting on night jobs, too!

Quick-starting, 4-cycle Onan air-cooled engine is direct-connected to Onan all-climate generator in a single, permanently-aligned compact unit.

Four plug-in receptacles, pilot light and carrying frame are standard. Other lightweight portable and mobile Onan plants from 500 to 10,000 watts.

To save time and speed work on construction and maintenance projects, equip your crews with Onan Portable Electric Plants.

Call your Onan distributor or write . . .

Onan ELECTRIC PLANTS

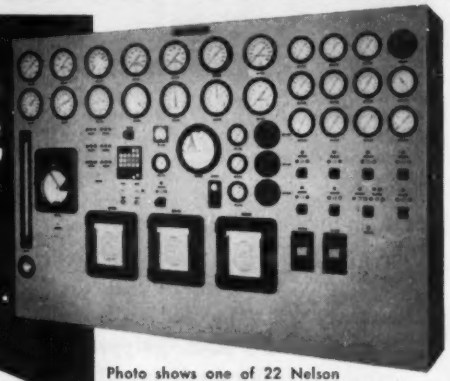
D. W. ONAN & SONS INC.

2954 University Ave. S.E., Minneapolis 14, Minnesota

YOU SURE

SAVE TIME

on the purchase and installation of NELSON control boards....



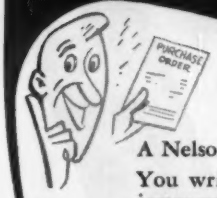


Photo shows one of 22 Nelson control boards which were recently built for a large utility.

A Nelson control board is a turn-key job.

You write *one* purchase order. We procure all of the instruments; do all of the sheet metal work, all of the welding, all of the wiring, all of the piping, and all of the testing.

The control board is shipped to your plant as *a completed assembly.* Installation time is reduced to a minimum.

The next time you need a control board, let us quote on your requirements.

Write for Bulletin No. 712.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

TECHNICAL LITERATURE

METAL STATISTICS—The 844-page pocket handbook entitled, "Metal Statistics, 1956" is in its 49th annual edition. As implied by the title, the book has statistical coverage on fuels, ferrous and non-ferrous metals, usually on the basis of production, consumption, prices, imports and exports. Included are: (1) A Buyer's Guide listing producers of metal and chemical products, and (2) a "Where to Sell It" list for scrap, ores, residues, drosses and skimmings. Available from American Metal Market, 18 Cliff Street, New York 38, N. Y. Price $3.50.

SPECTOGRAPH CHART—A revised 17½ by 22½ in. X-ray spectrograph chart showing characteristic secondary X-ray beams from elements drom Magnesium (Atomic No. 12) to Californium (Atomic No. 98) is available gratis from North American Philips Co, Inc, 750 S. Fulton Ave, Mount Vernon, N. Y.

ELECTRIC MOTORS INTERNATIONAL TRADE—"International Movement of Electric Motors, 1952-54," is the name of a 19-page report which discusses the trade of electric motors between various international markets and geographic areas, and the factors that effect that trade. Includes statistics. Price 20¢. U. S. Department of Commerce, Washington 25, D. C.

PLATING—A 36-page catalog covers analytical principles, use of apparatus, and methods for sampling used in working with plating solutions. It outlines 28 analytical methods for testing copper, nickel, silver, and other metal-finishing solutions. Entitled, "Simple Methods for Analyzing Plating Solutions," it describes equipment, component chemicals of solutions, atomic weight, acid concentrations, and electro-chemical data. Conversion tables and various analytical reagents are also included. Free, write Hanson-Van Winkle-Munning Co, Matawan, N. J.

FAIR TRADE—Analyses of fair trade laws—past, present, and future—by legal economic and business experts have been published as part of the proceedings of the Silver Jubilee Conference on Fair Trade, sponsored by the Bureau of Education on Fair Trade, 205 E. 42nd Street, New York 17, N. Y. No charge.

RUBBER TERMS—A "Glossary of Terms Relating to Rubber and Rubber-Like Materials" has been published by ASTM. Prepared by Committee D-11, the 121-page book contains more than 2,000 terms from a number of authoritive sources. It also has an appendix of trade names of apparatus and chemicals (the compositions of which have been published) related to rubber. Copies from American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $3.00 each.

COOLING TOWERS—A new CTI standards bulletin, No. STD-103, supersedes earlier bulletins No. STD-101 and STD-102. It combines a description of the CTI grades of redwood lumber for use in industrial water cooling towers and the corresponding allowable design stress values for application of the CTI grades in framework design. Also available is ATP-105, "Acceptance Test Procedure" which includes report and data forms used during an acceptance test on a CTI code tower. Booklets are $1.00 apiece. Cooling Tower Institute, 446 Emerson Street, Palo Alto, Calif.

CF&I GALVANIZED STEEL STRAND

for guy, messenger and overhead ground wire . . . quickly available from both eastern and western plants

No matter what part of America you're in, CF&I can quickly supply your needs for top-quality, guy, messenger and overhead ground wire. That's because three- and seven-wire CF&I Galvanized Steel Strand is made at both Buffalo, N. Y., and Pueblo, Colo.—a combination of plant sites that's ideal for speedy, nationwide distribution.

What's more, you can be sure of the quality of CF&I Galvanized Steel Strand because every phase of its production is supervised by the manufacturers of world-renowned Wickwire Wire Rope and Wire Rope Slings.

Next time you need strand—whether it's to your own specifications or to ASTM Specifications A-122 or A-363—be sure you explore the many advantages offered by CF&I Galvanized Steel Strand. Better still, contact your nearby CF&I representative today.

GALVANIZED STEEL STRAND

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise
Boston • Buffalo • Butte • Chicago • Denver • Detroit
El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans • New York
Oakland • Oklahoma City • Philadelphia • Phoenix
Portland • Pueblo • Salt Lake City • San Francisco
Seattle • Spokane • Wichita

CF&I OFFICES IN CANADA: Montreal • Toronto

4262

New space-miser network transformer now 12″ shorter, 20% lighter, occupies 15% less space

Slashing maintenance a dozen ways is the story of the new Westinghouse 500-kva subway transformer. Easier servicing and even better electrical performance place this product in a class by itself.

1. Protection against partial vault flooding—with a 12″ reduction in height, transformers can now be off the floor, set on I beams.

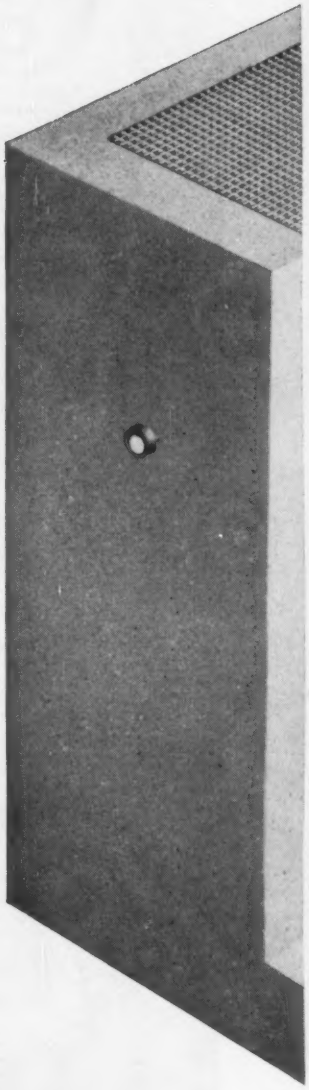
2. Installation easier, handling safer—new transformer is 20% lighter.

3. Contoured . . . round corners replace sharp edges on new diving bell tank.

4. Easier to wash down and paint, virtually self-cleaning—new contour design of Yukon Coolers eliminates 68 former sources of corrosion.

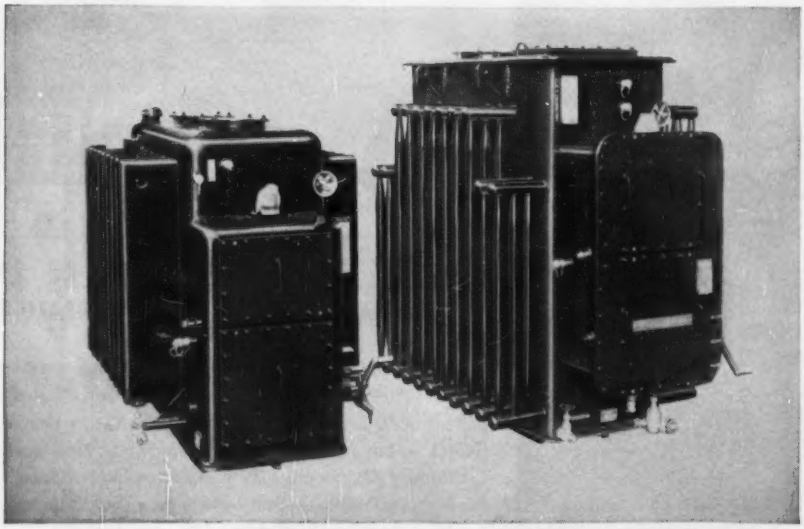
5. More accessible high-voltage terminal chamber—exclusive integral tank design lowers switch compartment; switch and core-coil assembly now housed in one smooth, unwelded exterior on a common base plate.

For network transformers that set the standard, talk to your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70781

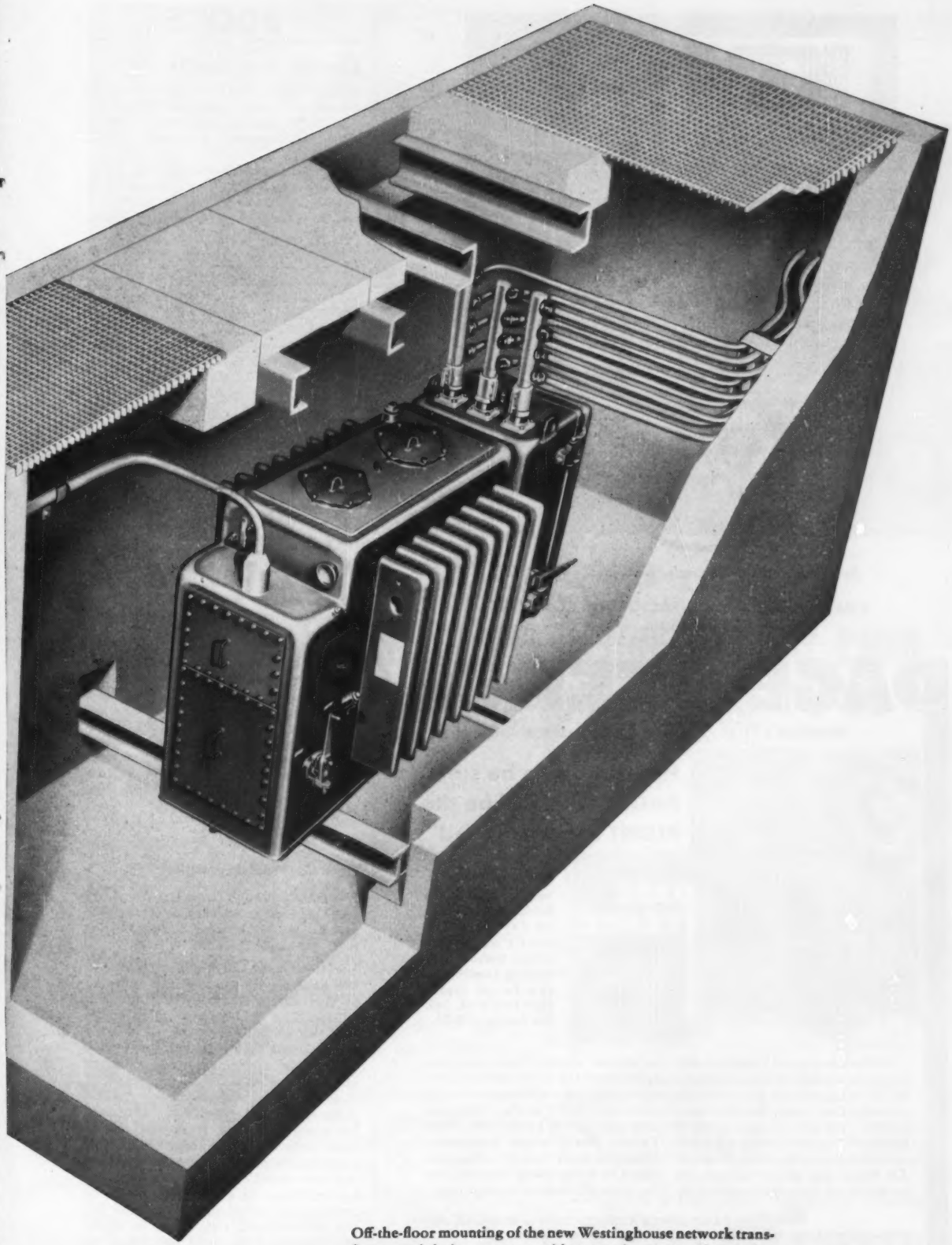


WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*



(*Right*) Previous 500-kva network subway transformer. (*Left*) New Westinghouse design features exclusive Yukon Coolers, greater spacing, more clearance to floor—refinishing is no problem.



Off-the-floor mounting of the new Westinghouse network transformer minimizes contact with corrosive matter; inspection and maintainance are quicker, easier.

KIM Hotstart
electric pre-heater
for Diesel and Gasoline Engines

KIM HOTSTART pre-heaters circulate hot water through engines when they are not in use; protect them against bitter winter weather; keeps engines responsive to the touch of the starter. Lightweight; low cost; high in savings. Thousands in use.

- QUICK, EASY STARTS
- SAVES WARM-UP TIME
- REDUCES ENGINE WEAR
- ELIMINATES NEED FOR HEATED TERMINALS

4 MODELS EASY TO INSTALL

See your automotive dealer or write for literature

KIM HOTSTART MANUFACTURING COMPANY
West 917 Broadway, Spokane 1, Washington

PAGE chain link FENCE
America's First Wire Fence—since 1883

Here's how to be sure PAGE Fence will be the RIGHT Fence for YOU

You are invited to write for a file-size folder packed full of information that's essential when making decisions leading to the fence that's BEST FOR YOU. Ask for Folder DH-26.

• When you need a fence it will be much to your advantage to have full knowledge of the many choices of component parts that PAGE provides. You can choose from 8 heights—4 fabric metals—2 types of metal posts—6 styles of gates. All these and other features are pictured and described in the folder offered above. It also supplies facts about the PAGE localized engineering and erecting service that assures highest grade workmanship and lasting satisfaction. Page Fence Association members, located in more than 100 cities, are listed in Folder DH-26. See that list for name of member nearest you.

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

BOOKS

Received Since Sept. 19

Analog Computer Techniques. By Clarence L. Johnson. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 264 pages, illustrated. Price $6.00.

Thermal Power from Nuclear Reactors. By A. Stanley Thompson and Oliver E. Rodgers. Published by John Wiley & Sons, 440 Fourth Ave, New York 16, N. Y. 229 pages, illustrated. Price $7.25.

Engineering Formulas and Tables. Published by Lefax, Sheridan Building. Ninth & Sansom Sts, Philadelphia 7, Pa.

Electrical Testing and Troubleshooting. By Philip T. Green. Published by Industrial Press, 93 Worth St, New York 13, N. Y. 282 pages, illustrated. Price $4.00.

Induction Heating Practice. By D. Warburton-Brown. Published by Philosophical Library, Inc, 15 E. 40th St, New York 16, N. Y. 192 pages, illustrated. Price $10.00.

Introduction to Solid State Physics. By Charles Kittal. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y. 617 pages, illustrated. Price $12.00.

Frequency Modulation Engineering—2nd Ed. By Christopher E. Tibbs and G. G. Johnstone. Published by John Wiley and Sons, Inc., 440 Fourth Ave, New York 16, N. Y. 435 pages, illustrated. Price $8.50.

Reference Data Radio Engineers—4th Edition. Published by International Telephone and Telegraph Corp, 67 Broad St, New York 4, N. Y. 1121 pages, illustrated. Price $6.00.

An Encyclopedia of the Iron & Steel Industry. By A. K. Osborne. Published by the Philosophical Library, Inc., 15 East 40th St, New York 16, N. Y. 558 pages, illustrated. Price $25.00.

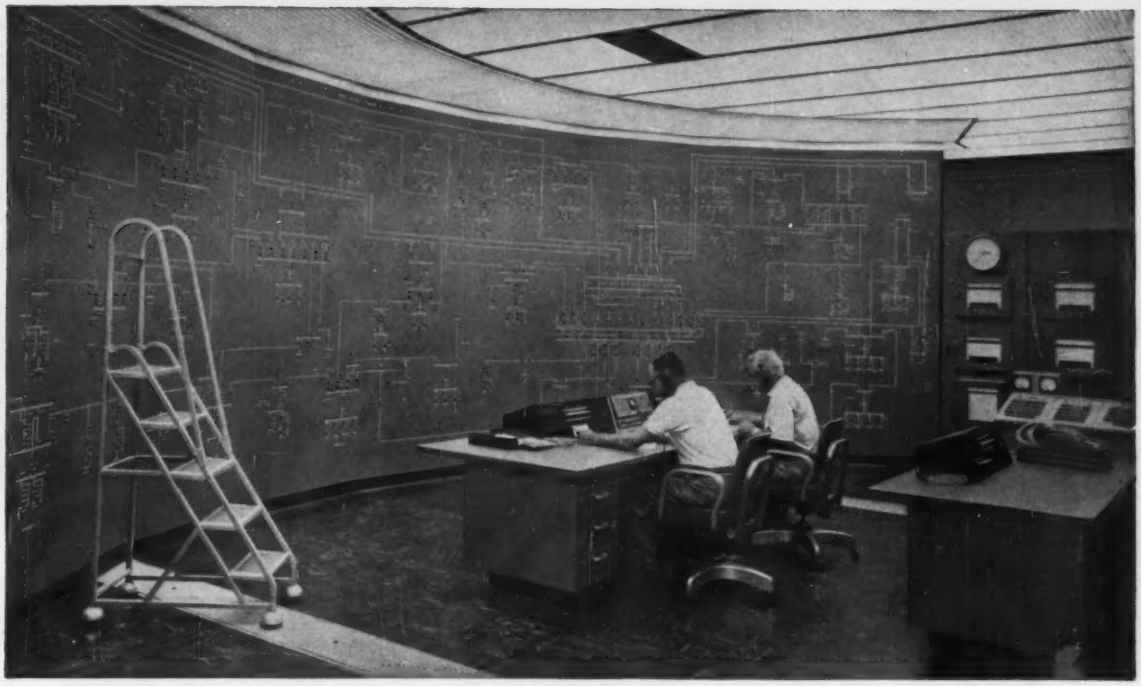
How to Predict Weather

Weather Analysis and Forecasting—Vol. 1. By Sverre Petterssen. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 443 pages, illustrated. Price $8.50.

Fifteen years of rapid progress in the analysis of weather are reflected in this extensively re-written second edition. The field is now so extended that two volumes are required to cover its theory. Vol. I concerns itself with motion and motion systems. Weather and weather systems is the scope of Vol. 2 to be released soon.

Background for Vol. I includes new knowledge gleaned from the world-wide network of upper-air sounding stations. Its methods include those using high-speed computers to apply extensive data to more rigorous forecasting. But provision is included for the conventional forecaster to apply his knowledge of local conditions to

(*Continued on page* 214)



New Jersey Power and Light Reports

GENERAL ELECTRIC PROGRESS LINE TWO-WAY RADIO PROVIDES MAXIMUM COVERAGE

New Progress Line Units Are Assigned Exclusively to Long-range Duty

After replacing many of its 100 mobile radio units with new General Electric Progress Line units, New Jersey Power & Light Company learned that the new G-E units perform so well that they are now assigned to the trucks that operate farthest from their base stations.

Get Greater Range and Better Reception

In addition to the excellent range of operation provided by the new General Electric units, Harold Mann, communications engineer, is enthusiastic about the high-fidelity quality of messages from mobile units. This, he explained, is due largely to the controlled reluctance microphones supplied with all Progress Line mobile units.

The utility's radio system includes 10 base stations throughout the northern half of New Jersey, 5 of which have 450-mc repeaters, and 100 low band 60-watt mobile units.

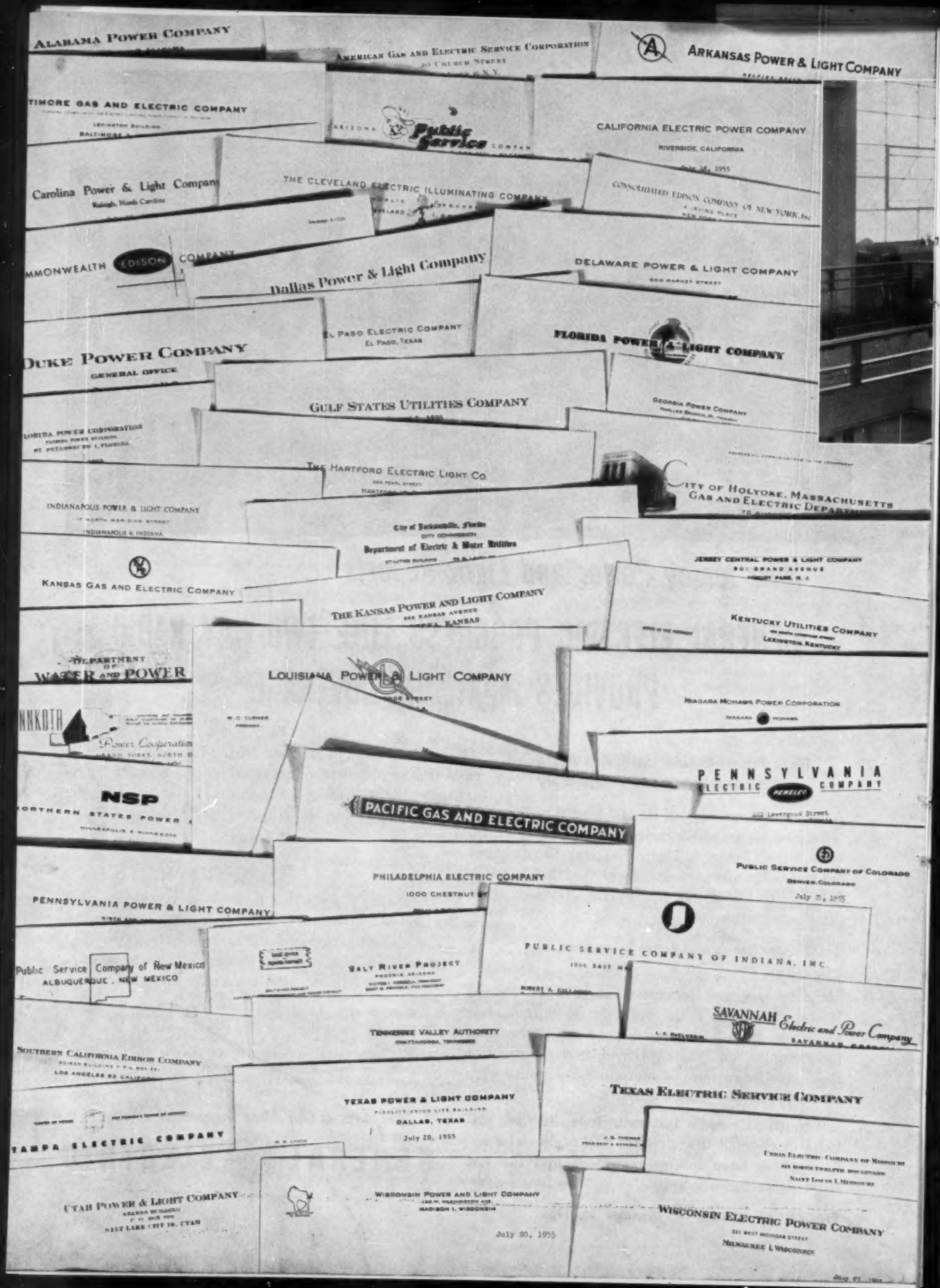
Maintenance of all New Jersey Power & Light Co. radio equipment is provided by the Warner Engineering Company, an authorized General Electric Service Station located in Upper Montclair, N. J.

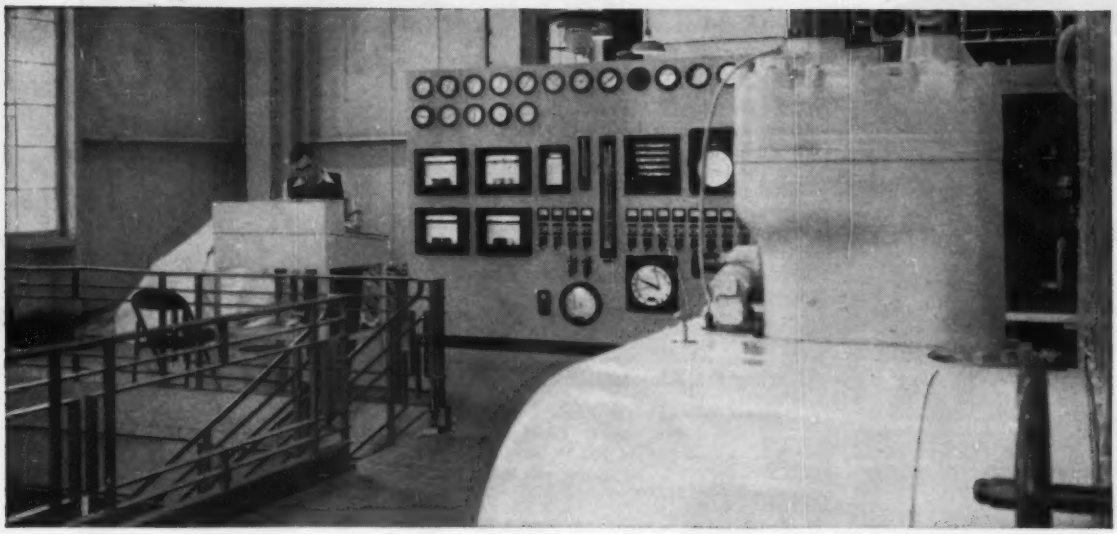
The utility reports that its 10-year experience with radio has proven a maintenance contract with the General Electric Service Station is more economical than providing service through its own maintenance department, and is equally effective.

For Sales and Service...see "Radio Communication Equipment" in your yellow pages. Or, write: General Electric Company, Communication Equipment, Section X19126-10, Electronics Park, Syracuse, New York. *In Canada:* C.G.E. Electronics, 181 Lansdowne Avenue, Toronto.

Progress Is Our Most Important Product

GENERAL ELECTRIC


ALABAMA POWER COMPANY
AMERICAN GAS AND ELECTRIC SERVICE CORPORATION
ARKANSAS POWER & LIGHT COMPANY
CALIFORNIA ELECTRIC POWER COMPANY
RIVERSIDE, CALIFORNIA
Carolina Power & Light Company
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
CONSOLIDATED EDISON COMPANY OF NEW YORK, Inc.
Dallas Power & Light Company
DELAWARE POWER & LIGHT COMPANY
DUKE POWER COMPANY
GENERAL OFFICE
EL PASO ELECTRIC COMPANY
El Paso, Texas
FLORIDA POWER & LIGHT COMPANY
GULF STATES UTILITIES COMPANY
Georgia Power Company
THE HARTFORD ELECTRIC LIGHT CO.
CITY OF HOLYOKE, MASSACHUSETTS
GAS AND ELECTRIC DEPARTMENT
INDIANAPOLIS POWER & LIGHT COMPANY
INDIANAPOLIS 6, INDIANA
City of Jacksonville, Florida
CITY COMMISSION
Department of Electric & Water Utilities
JERSEY CENTRAL POWER & LIGHT COMPANY
801 GRAND AVENUE
KANSAS GAS AND ELECTRIC COMPANY
THE KANSAS POWER AND LIGHT COMPANY
KENTUCKY UTILITIES COMPANY
LEXINGTON, KENTUCKY
DEPARTMENT OF WATER AND POWER
LOUISIANA POWER & LIGHT COMPANY
W. G. TURNER
NIAGARA MOHAWK POWER CORPORATION
NIAGARA MOHAWK
Power Cooperative
NSP
NORTHERN STATES POWER
PENNSYLVANIA ELECTRIC COMPANY
PACIFIC GAS AND ELECTRIC COMPANY
PHILADELPHIA ELECTRIC COMPANY
1000 CHESTNUT ST.
PUBLIC SERVICE COMPANY OF COLORADO
DENVER, COLORADO
July 21, 1955
PENNSYLVANIA POWER & LIGHT COMPANY
PUBLIC SERVICE COMPANY OF INDIANA, INC.
Public Service Company of New Mexico
ALBUQUERQUE, NEW MEXICO
SALT RIVER PROJECT
PHOENIX, ARIZONA
SAVANNAH Electric and Power Company
TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE
SOUTHERN CALIFORNIA EDISON COMPANY
TAMPA ELECTRIC COMPANY
TEXAS POWER & LIGHT COMPANY
DALLAS, TEXAS
July 20, 1955
TEXAS ELECTRIC SERVICE COMPANY
UTAH POWER & LIGHT COMPANY
SALT LAKE CITY 10, UTAH
WISCONSIN POWER AND LIGHT COMPANY
MADISON 1, WISCONSIN
July 20, 1955
WISCONSIN ELECTRIC POWER COMPANY
MILWAUKEE 1, WISCONSIN



Typical installation of Honeywell supervisory instruments for a 60,000-kw turbo-generator at the Tyrone, Kentucky plant of Kentucky Utilities Company.

YOU'RE IN GOOD COMPANY

when you choose . . . Honeywell instrumentation

You join America's best-known public utilities when you choose instrumentation by Honeywell. You'll find Honeywell instrumentation everywhere . . . in large stations and small. The reasons for this are clear.

With the precision, stamina, and reliability of Honeywell instruments, you get an important extra . . . service. This service begins with your first plans, and continues long after your instruments are installed. It includes:

Application engineering of instrumentation, custom-fitted to your plant by a staff experienced in power station measurement and control.

Installation and startup assistance by Honeywell service engineers.

Maintenance engineering, in emergencies or on a periodic service schedule, by factory-trained specialists located near you . . . in the more than 112 Honeywell offices in the United States and Canada.

Quick shipment of spare parts, from your local Honeywell branch office or from the Parts Depot in Philadelphia.

Training of your instrument men in up-to-date maintenance at the tuition-free Honeywell Education and Training Center in Philadelphia.

These are but some of the benefits you gain when you add your company's name to the list of prominent companies using Honeywell instrumentation. Get the full story from your nearby Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

H HONEYWELL

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

PROTECT
the performance of your 2-way radio

with
MOTOROLA
factory approved
replacement parts

Engineered, factory inspected and *tested* to new equipment standards . . . in fact, they're the same quality parts used in *new* Motorola equipment. You're assured of dependability and long life because Motorola, the leader, stands back of every replacement part. Prices are competitive—seldom higher, often lower than prices of "garden-variety" parts. You get shipped-same-day-order-received service. Order direct or from authorized Motorola Service Stations.

6/12 CONVERSION KITS
Low cost conversion kits make it possible to use 6-volt Motorola 2-way radios in 12-volt vehicles.

MICROPHONE COMPONENTS
Quality-checked and guaranteed replacement cartridges, cords, and hardware to restore like-new performance to microphones.

METERS
Expertly engineered to maintain very high accuracy through continued usage . . . jeweled bearings and polished pivots. Recessed zero adjustments.

TUBES . . . VIBRATORS . . . CAPACITORS . . . FUSES . . . LAMPS . . . PANEL METERS . . . SELENIUM RECTIFIERS . . . RESISTORS . . . SPEAKERS . . . SWITCHES . . . and all electrical or mechanical replacement parts for mobile 2-way radio.

MOTOROLA
Factory Approved Replacement Parts

BIG NEW PARTS CATALOG—yours FREE
72 pages—over 6000 parts
Mail coupon TODAY

Motorola Communications & Electronics, Inc.
Factory Parts Dept. EW
550 E. Illinois St., Chicago 11, Ill.

☐ Please send a copy of the new Motorola Communications Parts Catalog.

☐ Please send me the name and address of the closest authorized Motorola Service Station.

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

Books

(*Continued from page* 210)

machine-made data. Presentation frequently uses mathematical methods, but numerous diagrams help to explain the relationships.

Intended as a text for training forecasters, this book would be a useful reference for utility dispatchers who follow weather conditions as an indicator of system load or of storm damage.

Clearing the Atmosphere

Air Pollution Handbook. **Edited by P. L. Magill, F. R. Holden, and C. Ackley. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St., New York 36, N. Y. 607 pages with index, illustrated. Price $15.00**

Contributing editors of this new handbook are from industry, government, and educational and research institutes. The book covers the theoretical, technical, and practical aspects of air pollution. Chapters cover the science and causes of air pollution, and the effects on plants and animals. Aside from one section on the physics of the atmosphere, it uses very little mathematics. Nontechnical subjects such as city planning, industrial-plant location, and legislation control are also included.

An extensive coverage of air pollution abatement equipment is presented. This section gives material on both cost and design considerations for all types of precipitators and collectors.

The handbook is thorough in covering the subject and provides adequate references and illustrations. It provides a well needed collection of authoritative information on a subject of immediate interest to the utility engineer, city planner, and legislator.

Introduction to Steam Plants

Heat Power Fundamentals, 2nd Edition. **By C. M. Leonard and V. L. Maleev. Published by Pitman Publishing Corp, New York, N. Y. 527 pages, illustrated. Price $7.00.**

The book was written as a text for students taking their first course in heatpower engineering. Material on thermodynamic theory is sparse, the greater part of the book being devoted to the practice aspects and steam equipment of thermal power plants.

This second edition brings a thorough revision. A new chapter has been added on heat-transfer problems. And more space had been devoted to the steam turbine at the expense of the reciprocating steam engine. In addition to fundamentals and heat transfer, material is provided on water conditioning, fuels and combustion, vapor

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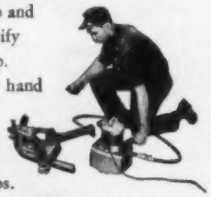

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cycles, and refrigeration. Equipment discussed includes: Condensers, pumps, feedwater heaters, boilers, turbines, and reciprocating engines, fans, and gas turbines.

Treatment is excellent and up-to-date. Emphasis is on the equipment and the practical problems associated with using this equipment in an operating cycle.

The book is highly recommended for an introduction to heat-power problems of the power plant.

Applying Mathematics

Mathematics for Electronics with Applications. **By Henry M.Nodelman and Frederick W. Smith. Published by McGraw-Hill Book Co., Inc, 330 W. 42nd St, New York 36, N.Y. 391 pages, illustrated. Price $7.00.**

By offering a set of problems based on current engineering practice, this text demonstrates the practical uses which the electronics and communications industry makes of mathematics. Six independent parts of the book deal with: Uses of mathematics in electronics, dimensional analysis, the algebra of circuit analysis, applications of series, applications of differential equations, and advanced mathematical topics.

This well-illustrated book would be of interest to the beginning or experienced utility communications engineer. It requires a background of calculus, physics, and electrical network theory.

Feedback Theory

Linear Feedback Analysis. **By J. G. Thomason. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St., New York 36, N. Y. 363 pages, illustrated. Price $8.50.**

Feedback has become prevailing practice for extending the accuracy range of electronic and servomechanism control systems. But seldom are reference and text material about this phase set forth as completely as in this book.

Written to supplement laboratory practice with corresponding circuit theory, the book opens with analysis, concepts, and characteristics of amplifier design. Stability in negative feedback systems is then presented from three different approaches. And the final chapters demonstrate application of these concepts in representative and tested circuits.

Mathematics is used extensively but need not be followed closely for adequate understanding of the text.

Engineers responsible for the growing resort to electronic controls in power systems and in industry will find assistance in this book. But they will find little in it about servo systems except for clarification of feedback theory which applies to them much as it does to electronic systems.

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Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1955-1960

Total Capacity Shipped and on Order and Scheduled for Shipment	Shipped 1955	Shipped First 9 Months of 1956	Shipped Last 3 Months of 1956	On order as of October 1, 1956: 1956	1957	1958	1959	1960 and Later	Total Scheduled for Shipment as of 10-1-56	New Capacity Scheduled 4-1-56 to 10-1-56	Capacity Shipped 4-1-56 to 10-1-56
LARGE STEAM TURBINE-GENERATORS[1] (10,000 Kw and Larger)[4]											
U. S. El Pwr Syst[1]	8,612,100	4,083,700	2,482,200	6,565,900	10,952,400	13,242,100	7,122,200	910,200	34,709,100	12,003,400	3,235,500
U. S. Industrials	91,800	253,700	187,500	441,200	1,285,100	153,700	100,000	.....	1,726,300	473,600	241,200
Outside U. S.	472,600	596,100	44,000	640,100	481,700	834,200	231,200	.....	1,591,100	818,500	333,600
TOTAL	**9,176,500**	**4,933,500**	**2,713,700**	**7,647,200**	**12,719,200**	**14,230,000**	**7,453,400**	**910,200**	**38,026,500**	**13,295,500**	**3,810,300**
Est. Open Capacity[2]	.....	.....	.....	.....	100,000	700,000	7,500,000	14,400,000[10]			
SMALL STEAM TURBINE GENERATORS[3] (4,000 to 9,999 Kw)[4]											
U. S. El Pwr Syst[1]	65,600	83,100	47,300	130,400	45,600	.....	.....	.....	92,900	21,200	51,900
U. S. Industrials	99,000	70,600	.....	70,600	120,600	15,000	.....	.....	135,600	57,500	51,200
Outside U. S.	53,400	78,700	12,500	91,200	79,400	7,500	.....	.....	99,400	86,900	57,500
TOTAL	**218,000**	**232,400**	**59,800**	**292,200**	**245,600**	**22,500**	.....	.....	**327,900**	**165,600**	**160,800**
Est. Open Capacity[2]	.....	.....	.....	.....	300,000	1,100,000	1,200,000	1,200,000[10]			
STEAM GENERATORS (450 Psi Pressure and Higher)[5]											
U. S. El Pwr Syst[1]	40,130	41,469	19,033	60,502	101,234	56,190	2,200	.....	178,657	58,675	27,330
U. S. Industrials	9,448	10,716	6,210	16,926	23,555	400	.....	.....	30,165	13,528	6,614
Outside U. S.	7,269	10,062	3,700	13,762	14,459	1,950	1,350	.....	21,459	12,479	6,603
TOTAL	**56,847**	**62,247**	**28,943**	**91,190**	**139,248**	**58,540**	**3,550**	.....	**230,281**	**84,682**	**40,547**
Est. Open Capacity[2]	.....	.....	.....	.....	15,000	96,000	151,000	155,000[10]			
STEAM GENERATORS (450 Psi Pressure and Higher)[6]											
U. S. El Pwr Syst[1]	47,008	49,117	21,649	70,766	116,866	65,203	2,611	.....	206,329	67,680	32,643
U. S. Industrials	11,228	12,005	7,004	19,009	26,980	451	.....	.....	34,435	15,621	7,384
Outside U. S.	8,293	11,993	3,579	15,572	14,293	2,144	1,485	.....	21,501	12,061	7,798
TOTAL	**66,529**	**73,115**	**32,232**	**105,347**	**158,139**	**67,798**	**4,096**	.....	**262,265**	**95,362**	**47,825**
WATER WHEEL GENERATORS[7] (4,000 Kw and Larger)[4]											
U. S. El Pwr Syst[1]	1,015,000	588,400	496,900	1,085,300	1,711,000	1,637,400	171,000	.....	4,016,300	512,900	538,600
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	174,200	86,500	.....	86,500	43,900	103,000	.....	.....	146,900	122,900	54,100
TOTAL	**1,189,200**	**674,900**	**496,900**	**1,171,800**	**1,754,900**	**1,740,400**	**171,000**	.....	**4,163,200**	**635,800**	**592,700**
Est. Open Capacity[2]	.....	.....	.....	.....	100,000	600,000	3,100,000	3,500,000[10]			
HYDRAULIC TURBINES (5,000 Hp and Larger)[8]											
U. S. El Pwr Syst[1]	2,242,500	830,300	487,400	1,317,700	3,818,400	2,338,600	896,500	55,000	7,595,900	1,884,100	555,700
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	126,100	11,400	.....	11,400	132,300	92,300	.....	.....	224,600	184,600	5,400
TOTAL	**2,368,600**	**841,700**	**487,400**	**1,329,100**	**3,950,700**	**2,430,900**	**896,500**	**55,000**	**7,820,500**	**2,068,700**	**561,100**
Est. Open Capacity[2]	.....	.....	.....	.....	400,000	2,000,000	3,600,000	4,400,000[10]			
POWER TRANSFORMERS (501 Kva and Larger)[9]											
U. S. El Pwr Syst[1] and Indl	42,391,000	37,593,000	20,327,000	57,920,000	39,704,000	5,112,000	2,199,000	.....	67,342,000	36,579,000	29,041,000
Outside U. S.	1,295,000	487,000	288,000	775,000	454,000	.....	.....	.....	742,000	486,000	325,000
TOTAL	**43,686,000**	**38,080,000**	**20,615,000**	**58,695,000**	**40,158,000**	**5,112,000**	**2,199,000**	.....	**68,084,000**	**37,065,000**	**29,366,000**
Est. Open Capacity[2]	.....	.....	.....	2,700,000	32,000,000	68,000,000	71,000,000	74,000,000[10]			

[1] U. S. Electric Power Systems. [2] Estimated open manufacturing capacity for production of additional units. [3] Manufacturers' max. rated capability.
[4] Figures in Kilowatts. [5] Figures in 1,000 lb steam per hr. [6] Figures in heat output, millions Btu per hr. [7] Manufacturers' rating of generators.
[8] Figures in horsepower. [9] Figures in kilovolt-amperes. [10] Estimated open manufacturing capacity only for 1960.

Generating Capacity Installations: 49,527 Mw

Seven significant developments relating to large generating equipment that have been brought out by the 20th Semi-Annual Electric Power Survey made by Edison Electric Institute, New York, are:

- Scheduled installations of thermal and hydraulic generating capacity (4 Mw units and larger) on U. S. power systems for the period 1956 through 1960 and later totals 49,528 Mw, the highest on record. This capacity tops the previous high of 42,464 Mw for the period 1953 through 1956.
- Installations of thermal and hydraulic generating capacity scheduled for 1958 promises a record of 15,513 Mw. This tops the previous record of 13,978 Mw in 1954.
- Efforts to reduce slippage in installations promises to advance 1,300 Mw in generating capacity for the 1956-through-1960 period. Accelerated installations of former scheduled 1959 installations will add 7% to the 1958 installations.
- Shipments of steam and hydraulic generating capacity scheduled for 1956 through 1960 and later promises a new high record of 38,818 Mw. Shipments scheduled in 1957 should set a peak of 12,709 Mw, and in 1958 there may be another peak totalling 14,880 Mw.
- Two other scheduled shipment records promised are: In 1957 hydraulic turbine capacity will be 3,818,000 hp, and steam generators with a total output will be about 101,234,000 lb steam per hr.
- Orders for equipment, if the rate for

(*Continued on page* 218)

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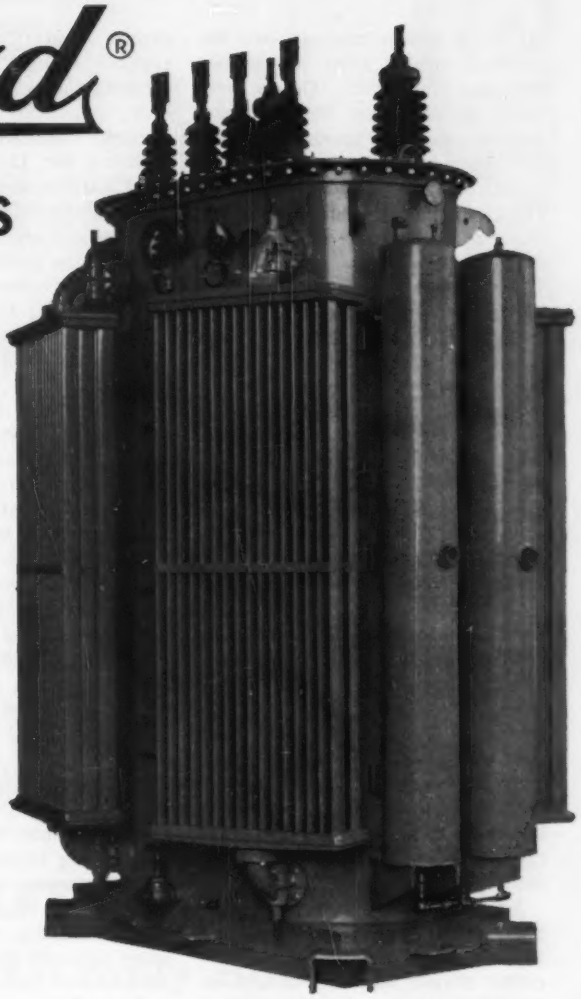

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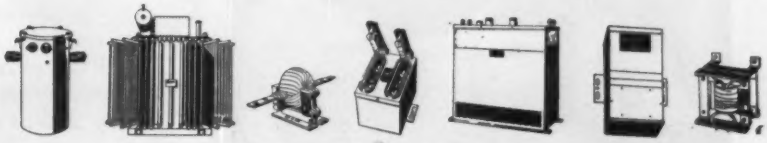


Generating Capacity Installations (*Continued from page* 216)

the first 9 months continues over the last 3 months of 1956, will surpass the peak for 1955. Orders over the 9 months were: Steam turbine generator capacity amounted to 14,-210 Mw; waterwheel turbine generators, 1,428 Mw; steam generators, 98,205 lb per hr; and power transformers, 53,873 Mva. Orders for hydraulic turbines amounted to 2,022,-100 hp, which is not a record.

• New orders for steam turbine generators and waterwheel generators totaled 12,537 Mw for the 6-month April-to-October period. This capacity is higher than any previous 6-month period.

Other new orders placed from April to October were: Steam generators totalling 58,675,000 lb steam per hr; power transformers totalling 36,579 Mva.

Other outstanding facts developed by the survey are:

Largest steam turbine-generators on order are two 450 Mw units, one for Indiana & Michigan Electric Co and the other for Appalachian Electric Power Co, both part of the American Gas & Electric Co system. Each turbine generator will be served by a boiler with a steam capacity of 2,900,-000 lb per hr or 3,295,000 Btu. This capacity is at the rate of 6.4 lb of steam per kw.

Steam generators rated on a Btu-per-hr basis have a 15% higher rating than on the lb-per-hr basis for orders during the 6-month period, April 1 to October 1, 1956. This is slightly lower (about 3%) than for previous 6-month period. The increased rating is due to high pressures, high temperatures and other performance characteristics.

Orders for 13 turbine-generators, rated 300 Mw and above, total 4,400 Mw. This capacity is 10% of scheduled thermal unit additions, or about 3.4% of the number (386) of units.

Orders for turbine-generators of 150 Mw and higher total 63% of scheduled thermal unit additions by capacity, or about 35% of the number of units.

On order are seven turbine-generators totalling 989 Mw for the following nuclear reactor power plants: Consolidated Edison Co of New York Inc, 250 Mw; Commonwealth Edison Co, 192 Mw; Detroit Edison Co, 150 Mw; Pennsylvania Power & Light Co; 150 Mw; Yankee Atomic Electric Co, 125 Mw; Duquesne Light Co, 100 Mw; and Rural Cooperative Power Association, 22 Mw. The Duquesne unit is scheduled for commercial operation in 1958; PP&L unit in 1962; and the other five units in 1960.

Lack of orders for generating equipment in 1953 and 1954 has resulted in low shipments in 1956.

Following information on production, shipments, and new orders are only for U. S. electric power systems. These data are from the foregoing table and elsewhere in the 20th Semi-Annual Survey.

Production . . . Electric generating equipment (4 Mw and larger), thermal and hydraulic, scheduled for production in 1956 totals about 7,782 Mw. This is 1,911 Mw lower than the shipments in 1955. Major decrease is in the thermal generating units.

Thermal and hydraulic generating capacity scheduled for production in 1957 (based on October 1, 1956 data) amounts to about 12,709 Mw, in 1958 14,880 Mw, in 1959 7,293 Mw, and in 1960 and later 910 Mw. The 1957 value is approximately a 28% increase over the value reported a year ago.

Power transformers scheduled for production in 1956 have a total of 57,920 Mva. This capacity is 37% increase over 1955 production. Scheduled production in 1957 is 39,-704 Mva.

Shipments . . . During the first 9 months of 1956 shipments of steam turbine-generators (10 Mw and larger) totalled almost 4,084 Mw. The amount is a 42% decrease or 2,960 Mw less than for the same period in 1955. This is due to a high installation rate in 1954 and 1955, a result of low ordering rate in 1953 and 1954, and the consequence is a low installation rate for 1956.

Steam generator shipments in the 9 months, Jan. 1-Oct. 1, 1956, totalled an output capacity of 41,469,000 lb steam per hr. This is an increase of 8,029,000 lb per hr or 24% over the 33,440,000 lb per hr for the same 1955 period. The increase was obtained although there was some steel shortage due to a steel strike.

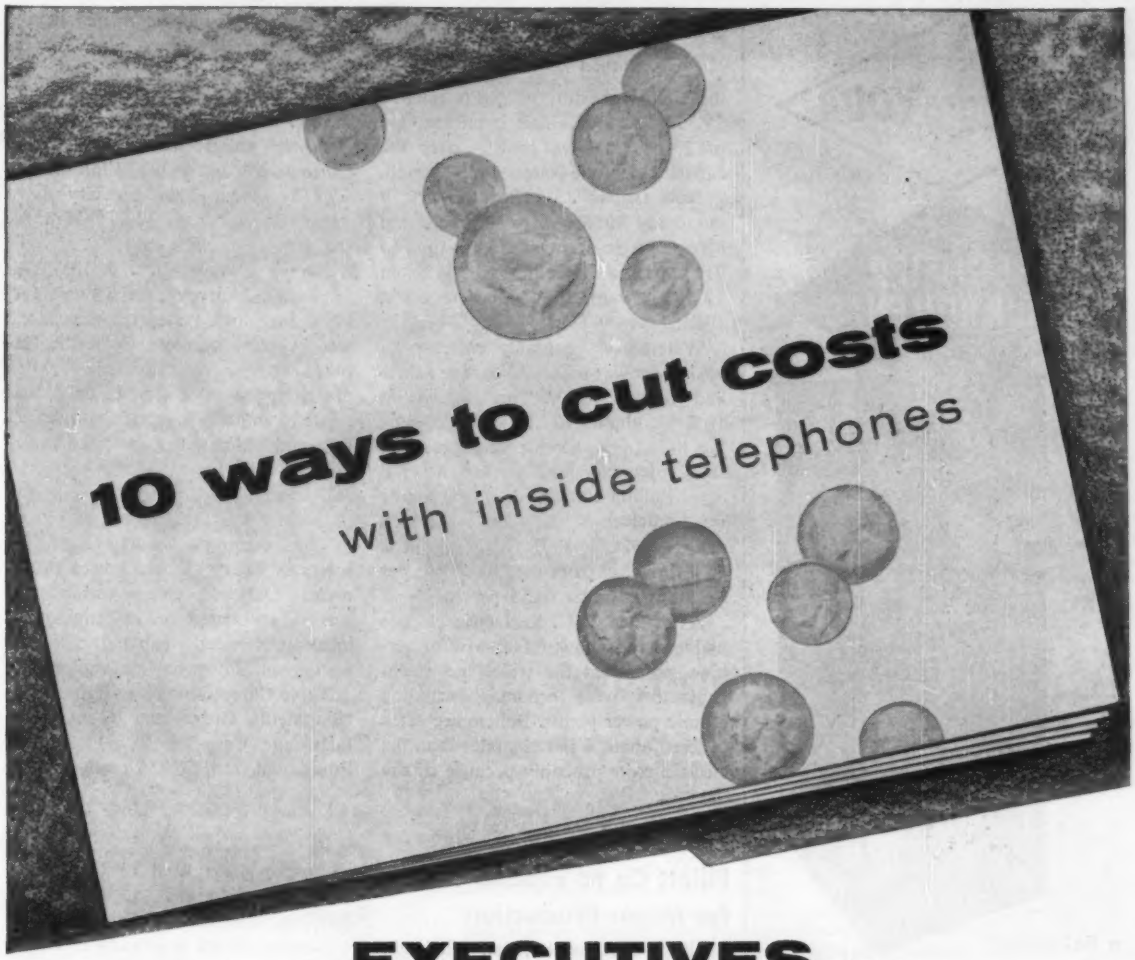
Power transformer shipments in (*Continued on page* 220)

Philco Employs ITV to Guard Plant

Philco Corp is using one of its Industrial Television installations at the Company's Government & Industrial Division for security control. By using ITV, one plant guard can observe three entrances to classified areas, it is reported. The inner door of each classified area is secured by electric locks which are controlled from the guard's post.

In addition to performing a utilitarian task, the ITV installation is expected to furnish valuable information for use in other types of plant control.

In the picture, the man appearing on the TV monitor awaits identification by the guard prior to being allowed to enter the classified area.



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Generating Capacity

(*Continued from page* 218)

the first 9 months of 1956 totalled 37,593,000 Mva. This is an increase of 2,924,000 Mva or 8% over the capacity for the same 1955 period.

New Orders . . . For the first 9 months of 1956 new orders for steam turbine-generators amounted to 14,211 Mw, an increase of 6% from 13,412 Mw for the similar period in 1955.

Waterwheel generator capacity of 1,428 Mw was ordered between Jan. 1 and Oct. 1, 1956. This capacity is 18% less than 1,724 Mw ordered during the same period a year previous.

Steam generators having a total output of 98,205,000 lb steam per hr was ordered during the 9 months prior to Oct. 1, 1956. This output is 45% increase from 67,538,000 lb per hr for the similar 1955 period.

As of Oct. 1, U. S. electric utilities had ordered about 6,000 Mw of turbine generators for which no steam generators were ordered, excluding atomic power plants. Boilers are often ordered about 6 months later than the electric units probably because of the shorter manufacturing cycle for the steam generating units. On the basis of 7.5 lb steam per kw, the boiler capacity would amount to about 45 million lb steam per hr.

Power transformers ordered between Jan. 1 and Oct. 1, 1956 totalled 53,873 Mva. This capacity is a 13% increase from 47,571 Mva for the same 9 months in 1955.

Survey Coverage . . . The 20th semi-annual survey covers steam turbine-generators, steam generators, waterwheel generators, hydraulic turbines, and power transformers. Data are compiled as of Oct. 1, 1956, and relate to shipments, scheduled production and estimated open manufacturing capacities for "1955 through 1960 and later."

Information was furnished by 19 of the country's leading manufacturers of heavy electric power equipment. Data on steam turbine-generators are based on manufacturers' maximum rated capability; other equipment on nameplate ratings.

Table Correction: Title should read: "Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1955-1956 **and Later.**"

Elliott Co to Expand Plant for Motor Production

Elliott Co, Jeanette, Pa., will begin shortly a $2 million construction program to provide additional manufacturing capacity, according to W. A. Elliott, company president.

Factory area of about 65,000 sq ft will be added to increase manfacturing efficiency on production of Elliott's Crocker-Wheeler type motors. This construction should be completed about May, 1957. It will be part of an over-all program extending for about 18 months.

GE Building Facility for High-rpm Rotor Tests

Construction of an "Overspeed Test Facility" to spin steam turbine and generator rotors at high speeds got underway recently at General Electric Co's Large Steam Turbine-Generator Department in Schenectady, N. Y.

The new test building, occupying some 8,700 sq ft and costing $2½ million, will be used to test rotors weighing up to 185 tons at 175 to 200% of their normal rpm.

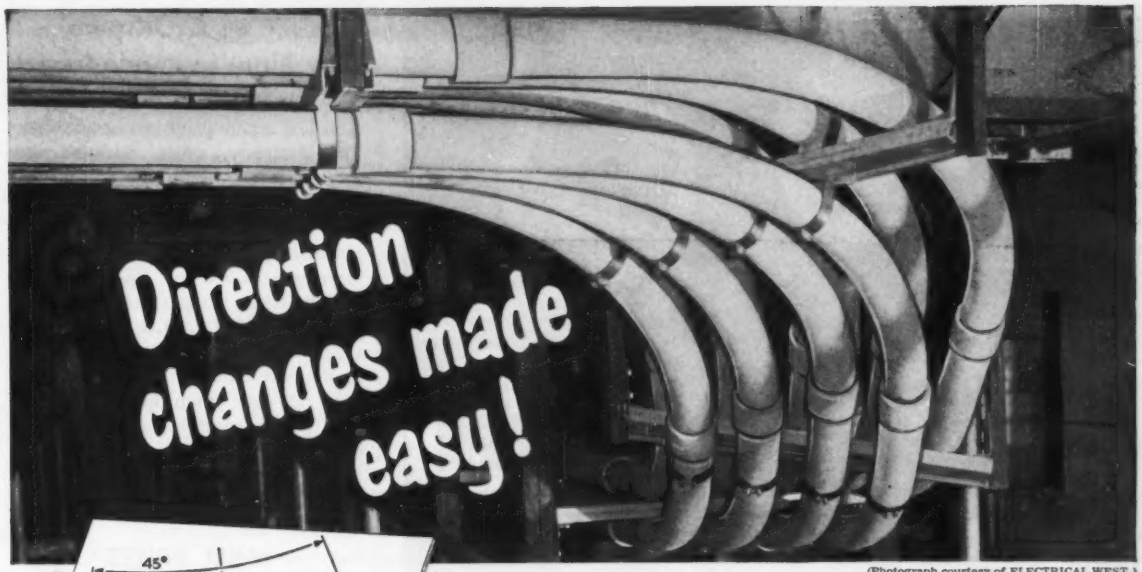
Because of the possibility of rotors flying apart at such speeds, the building will be specially built. In its center there will be a cylindrical test chamber, 57 ft long and 16 ft in diameter. The walls of the test chamber will be made of 14-ft reenforced concrete lined with a 1½-in. steel plate sleeve. A 5-ft thick concrete wall will seal off one end of the chamber, and a sliding steel door 4 in. thick will cover the entrance.

The rotor being tested will rest on bearing stands attached to a specially built type of railroad car which can be moved in and out of the chamber.

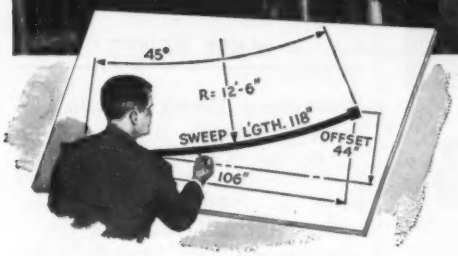
The rotor will be spun through breakaway couplings and gears attached to a 5,000-hp turbine to be fabricated at GE's Small Steam Turbine Department in Fitchburg, Mass. A 1,500-hp braking turbine will be used for deceleration.

A closed-circuit TV system will provide operators with a view of the test chamber during tests.

(*More M & M on page* 222)



(Photograph courtesy of ELECTRICAL WEST.)



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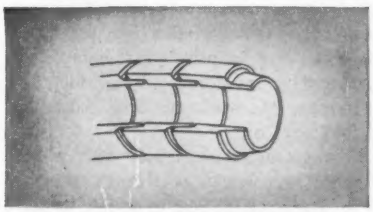
For instance, the new Transite 5° Bend Segments (shown at left) can be used alone to form simple and complex curvatures of any multiple of 5°. Used with other standard Transite curved fittings, they form curvatures of odd degrees. Thus, they enable you to simplify cross-overs and transformations . . . to clear obstructions . . . to form unusual or special bend or offset sections. They eliminate the need for purchasing special radii bends or sweeps. The other standard Transite fittings that facilitate directional changes are the offset bends, standard 45° and 90° bends, sweeps, curved segments, laterals, tees, elbows and deflection couplings.

For complete information write for new brochure EL-45-A, "Fittings and Dimensions of Transite Ducts." Contains all dimensional data required by the designer. Also available, "Transite Duct Underground Installation Sheet," EL-43-A. Johns-Manville, Box 14, New York 16, N. Y. In Canada, 199 Bay St., Toronto, Ontario.



5° bend segment sketched in detail. It consists of a straight section of Transite stock with a male taper on one end and a female taper on the other . . . each machined at an angle of 2½° to the center axis. Segments can thus be used single, or combined to form bend sections whose curvature is any multiple of 5°.

Photograph showing use of bend segments and curved segments with Transite Ducts.

5 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. Corrosion-Resistant. Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.

2. Permanently Smooth Bore. Transite makes long cable pulls easy, under any conditions. Danger of damage to cables is also minimized.

3. Incombustible. Transite will not burn or contribute to formation of smoke, gases, fumes. It confines burnouts, will not soften under heat.

4. Higher Thermal Conductivity. Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.

5. Easy to Install. Transite Ducts are light weight, easy to handle. Joints are quickly made. Long 10-foot lengths reduce number of joints in line.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE® DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company

GET Original FACTORY QUALITY

You are assured of highest quality when you specify Allis-Chalmers core and coil replacement assemblies. These are not rebuilt cores and coils, but completely new units, assembled and dried with the same skill and advanced equipment as standard A-C distribution transformers. All assemblies conform strictly to NEMA standards. They can be used in any make tank.

ALLIS-CHALMERS Core and Coil Replacement Assemblies

Complete Package for installation in 4 Simple Steps

All replacement units are packaged under oil in a specially designed metal container that protects against moisture and damage during transportation. Only 4 simple steps to install. Complete anchoring arrangement included with installation instructions.

Assemblies are available in ratings 25 kva and smaller, 15 kv and below. Use them in either conventional or protected types. Provision for mounting low voltage breaker, and a winding to operate signal light are standard.

Special moisture-proof package.

Complete replacement kit.

Get more information from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 61B6345A. A-4385

ALLIS-CHALMERS

Ansonia W & C Operates New Plant in Rhode Island

Ansonia Wire & Cable Co has established a new plant at Ashton, R. I. The company, which operated for more than 60 years in Ansonia, Conn., has taken a long-term lease on a three-acre, single-story, lift-type, slab-constructed plant from the Business Development Co of Rhode Island.

The wire manufacturer, according to Alden P. Lunt, president, specializes in the production of plastic-covered cable for electric utilities, railroads, municipal fire alarm and police controls, and telephone cables.

M&M BRIEFS

Westinghouse Electric Corp has reported these items:

- Receipt of a more than $4 million order from Kaiser Enginers to supply two 50-Mw turbine-generators, transformers and switchgear for a zinc smelting plant being built for St. Joseph Lead Co on the Ohio River near Monaca, Pa.
- Installation of $1,500,000 worth of equipment for what is expected to be the steel industry's first completely automatic roughing mill at the Aliquippa, Pa., works of Jones & Laughlin Steel Corp.
- An order to supply two waterwheel generators at Brazil's Itutinga hydroelectric project to double its generating capacity to 56 kw.
- Receipt of orders valued at $428,000 for vantilation equipment to be installed in the House of Seagram Building under construction in New York City.

Burndy Engineering Co's library, an endowed institution, has supplied U. S. Information Agency with 340 prints of "American Scientists and Inventors." The reproduction depicts citizens whose contributions were the basis for today's technical advances. Copies will hang in USIA reading rooms in 59 Free World counties.

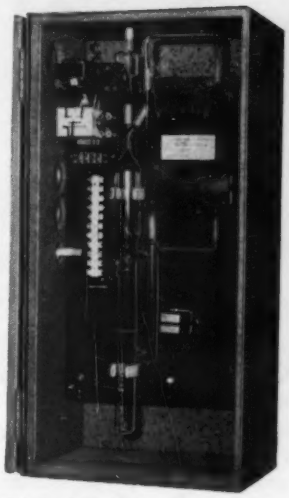
Edwin F. Guth Co, St. Louis 3, Mo., has its mobile unit, the "Travelcade of Lighting," on the road. The Travelcade provides information on luminaires, from whole ceiling installations to ecclesiastical lighting.

for more precise measurement . . .

K&M EBONIZED ASBESTOS

K&M Ebonized Asbestos, used for mounting panels, has exceptionally high dielectric strength. It is made of inorganic materials, pressure-molded and impregnated with a special insulating compound. It has high mechanical strength that makes components stay put and provides great resistance to vibration, shock, and temperature changes. Its uniform density and relatively light weight make it easy to handle and machine.

K&M Ebonized Asbestos is ideal where strong, shatterproof insulating material is required . . . on switchboards, bus bar supports, cabinets, compartment linings, bench boards and testing tables.



This Leeds & Northrup Gas Analysis Equipment is mounted on K&M Ebonized Asbestos to help ensure precise electrical measurement and longer life.

Write for information on K&M Ebonized Asbestos and other outstanding K&M insulating materials including Monobestos, K&M asbestos cloth, tapes, and tubing for electrical equipment.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

In Canada: Atlas Asbestos Company, Limited; Montreal, Toronto, Winnipeg, Edmonton, Vancouver

K&M Ideal in asbestos

Southern California Edison Ups Davenport

James F. Davenport has been elected executive vice president of Southern California Edison Co.

After graduation from Harvard University's School of Engineering in 1926, he started at Edison as a draftsman. A series of promotions followed. He was elected hydro engineer in 1929, superintendent of hydroelectric generation in 1931, superintendent of generation and assistant manager of operation in 1940.

Davenport left the company to serve a four-year-term in the Air Force and returned as an assistant vice president in 1946. Elected a vice president in 1951, he left again a year later to serve as an administrator for the Defense Electric Power Administration. He assumed the post of vice president and general manager in 1954.

Davenport just returned last month from Geneva, Switzerland, where he was the United States' Delegate to the 1956 session of the Committee on Electric Power, one of the principal subsidiary organs established by the United Nations Economic Commission for Europe.

JAMES F. DAVENPORT

VEPCO Names Hopkins VP

Virginia Electric & Power Co has designated Ray C. Hopkins as vice president of its Western Division. This new post becomes effective with the retirement resignation of James M. Wilson, former vice president in the Western Division.

Hopkins served in several capacities with the Stone & Webster Engineering Corp from 1921 to 1927 before coming to VEPCO as executive assistant in Richmond. He was named manager at Fredericksburg in 1931 and appointed to Potomac district manager in 1946, a post he had held until assuming the vice presidency.

Resignation of E. S. Fitz, vice president of engineering and construction, was announced along with Wilson's, but to date no successor has been named to fill his post.

RAY C. HOPKINS

Kaufmann Becomes Treasurer

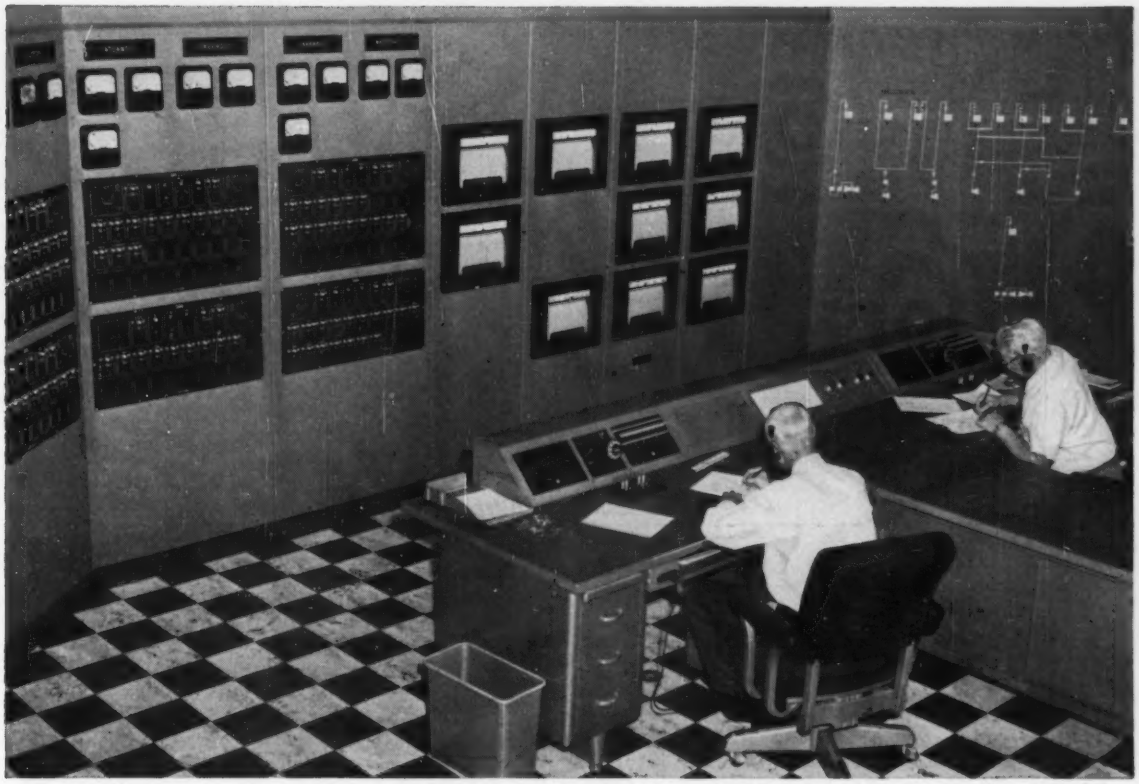
Kuhlman Electric Co has announced the election of Arthur Kaufmann as new company treasurer.

Kaufmann, in assuming the treasurer post, releases G. R. Fluehr for other administrative duties. Company president and board chairman, Fluehr has acted as treasurer since 1939.

This is Kaufmann's first appointment with Kuhlman Electric Co. He comes to the company after serving Arthur Anderson & Co for eleven years as account manager.

Kaufmann, a graduate of the University of Denver with a bachelor of science degree in accounting, is a certified public accountant in the states of Colorado and Michigan.

ARTHUR KAUFMANN



This new Systems Operations Center of the Jersey Central Power & Light Company keeps in touch with remote stations through Bell System channels for telemetering and remote control.

Bell System communications help Jersey Central regulate power transmission

Colored pegs in wall diagram indicate segments of line to be isolated for maintenance work.

Channels for telemetering and remote control enable the Jersey Central Power & Light Company to regulate power transmission every step of the way from generator to home, store and factory.

An engineer glances at the dials, which give him a running picture of the system and the changing demands he has to meet—information which has been brought to him by Bell System telemetering channels.

From his position, he switches loads, starts and stops generators and localizes failures—even at distant points—over a network of remote control channels provided and maintained by the Bell System.

If you would like to know more about how Bell System communications can help you, an engineer will be glad to survey your company's needs. There's no obligation. Why not call your Bell Telephone representative today?

BELL TELEPHONE SYSTEM

Private Line Telephone, Private Line Teletypewriter
Channels for: Data Transmission, Telemetering, Remote Control, Telephotograph, Closed Circuit TV

Turner and Pitzer Are Designated as Vice Presidents

Announcement has been made of the election of R. K. Turner as vice president of Carbide & Carbon Chemicals Co. G. L. Pitzer will replace Turner as vice president-production of Bakelite Co. Both companies are divisions of Union Carbide & Carbon Corp.

Turner began his association with Union Carbide in 1924 in the research department at Clendenin, West Virginia. He progressed through the chemicals organization to superintendent of the South Charleston plant in 1940 and in 1946 went to New York as assistant works manager.

Pitzer started with Union Carbide in 1933 at the South Charleston, W. Va., laboratory. He has held various posts with the company in Canada and Texas before coming to New York in 1952 as works manager.

R. K. TURNER G. L. PITZER

PERSONAL BRIEFS

Virginia Electric & Fower Co has announced the following executive changes: **James A. Rawls** will become manager of engineering and construction. He succeeds **E. S. Fitz** who is resigning. **George M. Tatum,** formerly chief engineer, will take over as manager of planning and research. **Robert L. Ware** will succeed Rawls as system manager of transmission and distribution and **L. L. Eley, Jr,** presently district superintendent at Charlottesville, will fill the post vacated by Ware's appointment.

Frantz Lupton has been placed in charge of a newly created residential and commercial development division at the Salt River Power District. In addition to his new duties, Lupton maintains his post as chief of the Industrial Development Division. **Don Parlett** assumes the position of supervisor in the same division. **Glenn Baker** becomes supervisor of Salt River Power District's Residential and Commercial Development Division.

A new assistant controller for Detroit Edison Co is **Ralph B. Grierson.**

George L. Burr, a director since 1941, has announced his resignation at a recent Detroit Edison Co board meeting.

Electrical Utilities Co has announced the appointment of **Richard C. Waldorf** as sales manager, **Miss Eunice M. Moore** chemical engineer, **A. R. Milliken** application and development engineer, and **James J. McNally** assistant chief engineer.

Francis J. Shovlin was made superintendent of lines and substations for Pennsylvania Power & Light Co. He succeeds **D. A. Campbell,** who was promoted to superintendent of operations for PP&L.

Black Hills Power & Light Co has designated **Harry S. Peterson** as director of personnel and public relations. for the utility.

H. O. Rothell has been named assistant vice chairman of Texas Power & Light Co at a recent board of directors meeting.

Julius H. Hagenguth, formerly manager of General Electric Co's high voltage laboratory, will assume the position of manager of GE's newly formed high voltage research . . . **John M. Tome** will direct market research and product planning for GE's chemical materials department. Tome was formerly a market analyst in that department.

Former Jackson Division Manager **Herman H. Koelbel** has been appointed administrative assistant to the vice president of Consumers Power Co. He is succeeded by **Frank B. Adams.**

In the Tulsa Division of Public Service of Oklahoma **Jacques Cunningham** has been upped to Acting Division Manager to succeed **H. S. (Jack) Kilby** who retired recently. Kilby will continue to serve as consultant in Oklahoma Public Service Co's industrial department.

Harvey Williams, formerly vice president of Avco Manufacturing Corp and General Manager of its International Division has been upped to president of Philco International Corp.

Julius A. Krug, former U. S. Secretary of the Interior has been named head of a UN Technical Assistance Administration to advise the Pakistan government on a flood control and water utilization program.

The 1956 Nobel Prize in Physics has been awarded to the three inventors of the transistor, **Drs John Bardeen, Walter H. Brattain,** and **William Shockley.**

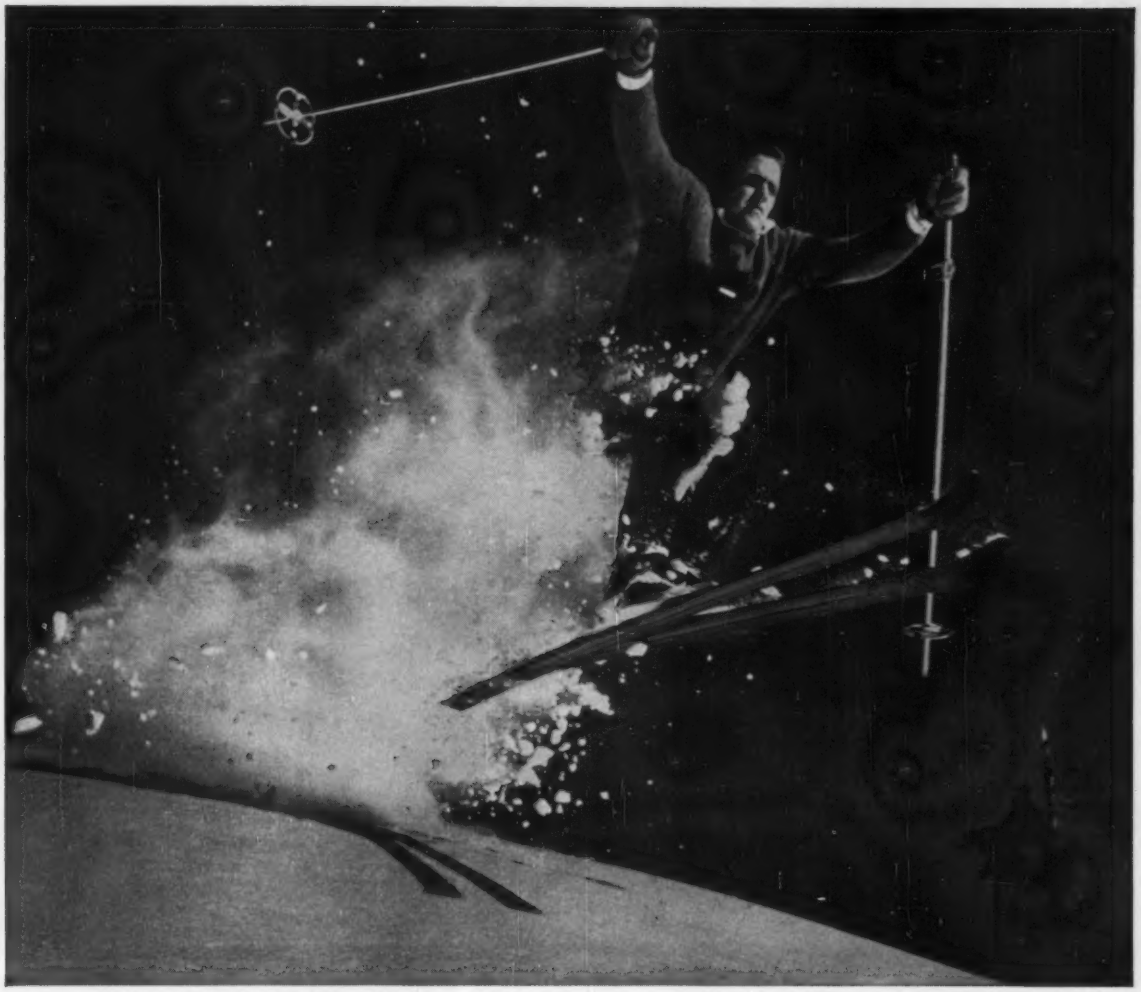
OBITUARY

David E. Cauble, 57, commercial and credit manager of Duke Power Co died suddenly of a heart attack.

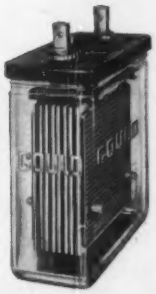
Leo King Fox, 54, who has acted as staff secretary for the several electric appliance sections of NEMA since 1947, died recently at New York City home.

John E. Casey, 63, superintendent of Jersey Central Power & Light Co's E. H. Werner Station, died recently following a short illness.

Zadoc E. Merrill, 75, board chairman of Pacific Power & Light Co, died at his home last month following an extended illness.



LEAP ... but not before you look at Gould's "extra-value" features:



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

More Aggressive Research Program
More Application Engineering Help
More and Better Battery Performance

You'll agree, the leap to Gould smooths out all battery problems. Be sure to specify Gould. Gould-National Batteries, Inc., Trenton 7, N.J.

Always Use Gould-National Automobile and Truck Batteries

gould
BATTERIES
More Power to you from Gould

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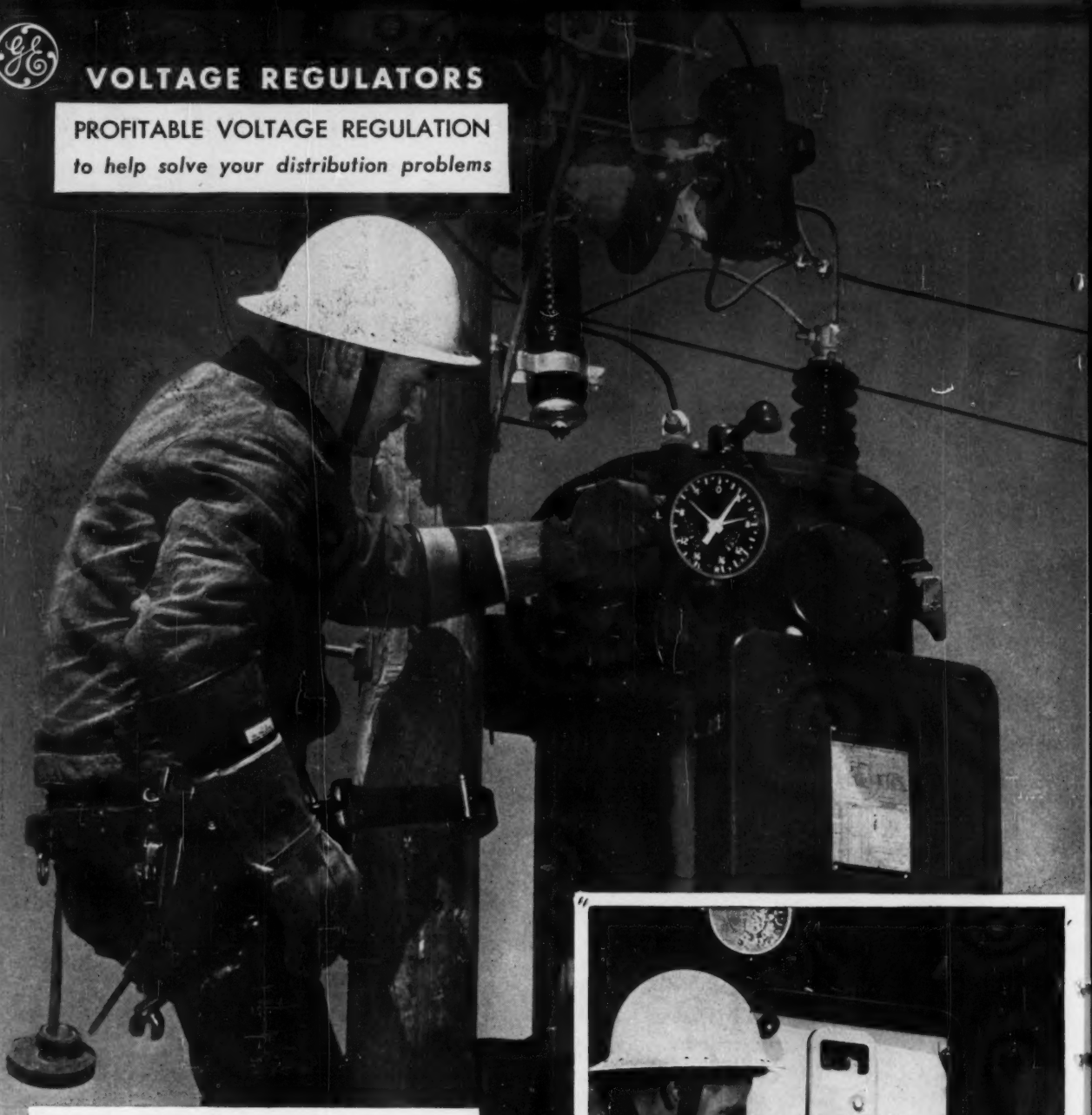
VOLTAGE REGULATORS

PROFITABLE VOLTAGE REGULATION

to help solve your distribution problems



NEW SIMPLE EXTERNAL ADJUSTMENT of regulating range, made on the pole without de-energizing, *increases current capacity* up to 160% of rated amperes.

Select Desired Regulating Range With New Position Indicator	Current Capacity of ML-32 Increases* (Shown as percentage of rated current)
± 10%	100%
± 8¾%	110%
± 7½%	120%
± 6¼%	135%
± 5%	160%

*To a maximum of 400 amperes

NEW CONTROL PANEL has been redesigned in order to make inspection easier and more accurate. This means you can reduce maintenance costs by using ML-32 regulators.

With NEW G-E LOAD BONUS POSITION INDICATOR you can now

INCREASE CAPACITY WITH REGULATOR ENERGIZED

NEW LOAD BONUS switch located in the position indicator of the redesigned General Electric ML-32 step voltage regulator now permits simple, one-man, on-the-pole adjustment of current capacity and regulating range *without de-energizing* the regulator. With "raise" and "lower" settings independently adjustable, current capacity up to 160% of normal at ±5% regulation is available up to 400 ampere maximum. ***Load Bonus is now standard equipment on all G-E pole and station-type single-phase step regulators.***

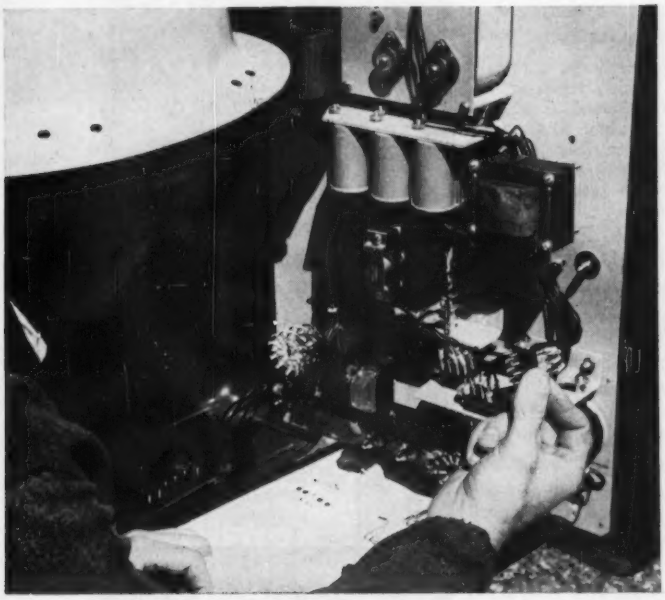
OTHER NEW FEATURES that mean increased dependability, accuracy, and economy include quickly interchangeable plug-in control components; internal channel design for easier, safer untanking by one man; and a larger, clearer tap-position indicator for improved visibility. These features, shown in detail on these pages, make this the most advanced step regulator on the market today.

UP TO 50% SAVING in first cost, compared with all other types of feeder or station regulating equipment, is an additional benefit of the new G-E ML-32 step regulator. A complete line is available —25 to 167 kva and in five voltage classes.

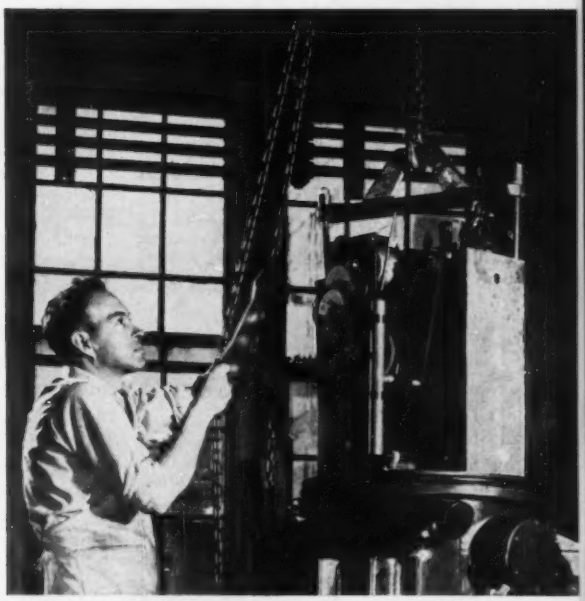
COMPLETE INFORMATION is contained in a new bulletin, GEA-5752. For your copy, contact your G-E Apparatus Sales Representative, or write to General Electric Company, Section 423-14, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



NEW PLUG-IN COMPONENTS mean faster, more economical maintenance. Voltage-regulating relay, line-drop compensator, time-delay relay, and the control panel itself all have quickly removable plug-in connectors.



NEW EASY UNTANKING speeds maintenance. Entire regulator is a one-piece assembly mounted between protective supporting channels. Lifting eyes at top of channels allow quick, safe removal by one man.

THE FCC REQUIRES THAT EVERY 2-WAY RADIO LICENSEE MUST OBSERVE CONELRAD RADIO ALERTS. HERE'S THE SURE WAY TO DO IT.

POSITIVE ALERTING* with MOTOROLA Conelrad Monitor

* Tone-activated for protection from false alarms

ONLY MOTOROLA'S CONELRAD MONITOR HAS THE 3 MOST WANTED FEATURES

POSITIVE ALARM SECURITY—Motorola's Conelrad Monitor is the *only* receiver that depends upon *both* segments of the Conelrad sequence for operation . . . the carrier break *and* the 1000 cycle tone. Carrier breaks caused by a normal shutdown of a broadcast station, for example, won't cause a false indication.

FAIL-SAFE INDICATION—An *extra* and *separate* alarm system within the monitor warns you of non-standard operation. The "fail-safe" light gives you 3-way protection, alerting you to (1) abnormally weak received signal, (2) complete absence of carrier, or (3) non-operative receiver.

CRYSTAL-CONTROLLED CHANNELS—Up to 5 crystal-controlled channels, including the two Conelrad frequencies, give you positive assurance that your monitor will always be on frequency. No need to worry about excessive heat or aging components detuning your receiver. An additional channel is tuneable over the broadcast range.

JUST SET IT, FORGET IT...

Just turn the power on, and select the channel. Then forget it! The dispatcher needn't turn it off every time he goes off duty, because the alarm on a Motorola Conelrad Monitor *can't* be set off by a routine station break.

ACT TODAY!

Motorola Communications & Electronics, Inc.
4501 Augusta Blvd., Dept. CM-10
Chicago 51, Illinois

☐ I want a Motorola Radio Communications Engineer to give me the full facts soon.
☐ Rush me by mail more information on the Motorola Conelrad Monitor.

Name_____
Company_____
Address_____
City_____ Zone____ State_____

SALES ASSIGNMENTS

Company Staffs

General Electric Co's silicone products department has created new Chicago and Western sales districts and has named Milton C. Lauenstein, and Robert T. Daily, respectively, to head them . . . K. P. Cox and S. A. Creson, Jr, have been appointed traveling sales specialists for GE's medium transformer department at Rome, Ga.

Minnesota Mining & Manufacturing Co has advanced Richard A. Kelley to Chicago branch sales manager of its Electrical Products Division.

John A. Roebling's Sons Corp has assigned John E. Heald to the mid-west territory of their Construction Materials Division. John H. Bass, Jr, will replace Heald as a representative in the south east area of Roebling's Construction Materials Division.

Federal Pacific Electric Co recently named John Chickering, formerly applications engineer for the New York City Industrial Division, to assume the post of Washington, D. C., branch sales manager.

Allis-Chalmers' industries group has appointed Dan H. Onstine, Jr, and Gerald B. Schulz as sales representatives in the Los Angeles and Dallas districts, respectively.

Kaiser Steel Corp's sales at Phoenix, Ariz., will be handled by James A. Wiggs.

Columbia Broadcasting System, Inc, has made Delmah F. Ore sales coordinator for semiconductors for its Tube Manufacturing Division.

REPRESENTATIVES

Miller Co has announced the appointment of Robert C. Evans as sales representative in the Utah-Idaho area for their Illuminating Division. Evans is sales manager of the Ariel Davis Supply Co, Inc, agents for the Ariel Davis Manufacturing Co in intermountain states.

Beware of Rigid Standards

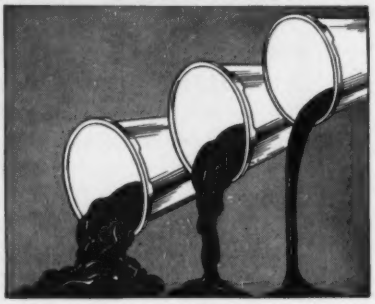
"Russia can dictate national standards" but their methods contain elements of self-defeat, said H. Thomas Hallowell, Jr, American Standards Association president. He claims such methods "can become too rigid, overshoot their mark, and lose completely their usefulness . . ." Free societies, he warned, also face danger from "lethargy and personal interests."

As a free nation the United States must remain alert.

Insulating and Cable-Pulling

COMPOUNDS

of Record-Breaking Performance



Minerallac gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work. . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks all others in quality.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

MINERALLAC

specify SHAW-PERKINS COOLING RADIATORS

. . . design standard for the transformer industry

Built by specialists, properly designed throughout to give *any make of transformer* full advantages of economical, dependable thermo-siphon principle of self-cooling. Valves, flanges, elbows, available. Transformer tanks built to customer's design.

Write today for full information.

SP-15

MANUFACTURED BY
SHAW-PERKINS
201 EAST CARSON ST. • PITTSBURGH 19, PA.

1½ kva too small?

G-E Service Shop

uprates to 5 kva!

There's lots of life in your old distribution transformers yet! Just let your local G-E Service Shop replace the old cores and coils with new factory-built units of higher kva capacity. Your transformers are returned good as new. There are 52 G-E Service Shops throughout the country—one near you. 431-33

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEWS IN BRIEF

(*Continued from page* 99)

adjacent 235,000-hp unit which is scheduled to go into service by mid-1958.

The State Electricity Commission of **Victoria, Australia,** plans construction of a five-unit station with up to 1,000-Mw capacity. First 200-Mw unit is slated for 1964 operation.

HYDRO

Niagara Mohawk Power Corp plans construction of a $5-million project at Prospect, including 17,350-kw turbine generator and concrete dam, as part of a second hydroelectric power development on West Canada Creek . . . Corps of Engineers has placed seventh 64,000-kw generator at **Chief Joseph Dam** in operation to bring installed capacity to 448,000 kw. Nine more units are slated for installation during the next two years.

Cowlitz County (Wash.) PUD proposes plan for projected $38-million Muddy Creek dam on Lewis River under which Pacific P&L will continue engineering work and possibly begin construction. PUD would reserve the right to take over construction, financing, and ownership until a year after FPC has granted a construction license.

Apparent low bidder for four 45,000-hp turbines for **Fort Gaines lock and dam** in Georgia is Newport News Shipbuilding & Dry Dock Co with bid of $2.9 million. There were no foreign bidders . . . Contract for construction of storage dam, diversion dam, canal and appurtenant works on Quinsam River on Vancouver Island was awarded by **B. C. Power Commission** to Vancouver Pile Driving & Contracting Co, Ltd, and Belmont Construction Co, Ltd. Project would increase storage for operation of Ladore Falls plant and John Hart station.

ATOMIC

Consolidated Edison Co will begin construction next month of its $55-million nuclear fueled electric generating plant at Indian Point, N. Y. . . . **Power Reactor Development Co** has been granted postponement from Dec 10 to Jan 8 on the hearings on its

(*Continued on page* 232)

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

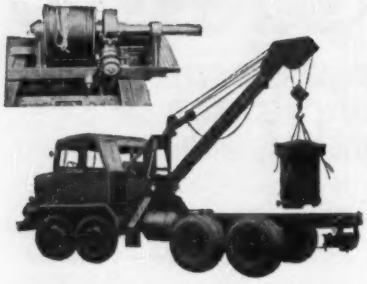
Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5, AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862 63rd ST., BROOKLYN 20, NEW YORK

NEWS IN BRIEF

(*Continued from page 231*)

application to build its $56-million atomic power plant on Lake Erie near Monroe, Mich. Labor unions opposing the project agreed to the postponement.

The reactor vessel for **Canada's first atomic power plant** has been ordered by Canadian General Electric Co, Ltd, from Babcock & Wilcox, Ltd. The plant is being built for the government at Des Joachims on the Ottawa River for 1959 service.

The new 1,000-kw $1-million nuclear reactor, most powerful in the university field, has been dedicated at **University of Michigan.** Known as the Ford Nuclear Reactor, the swimming pool type facility will be used for nuclear research and training of atomic scientists.

Yankee Atomic Electric Co's $35-million plant will be financed by 50% in common stock because of a state law. Clearing and site work is progessing on 1400 acres at Rowe, with 600 acres available if needed. Operation date is set for late 1960.

Plans for construction of a **new British atomic research center** on a 700-acre site at Winfrith, near Dorchester, have received local approval. Ministerial approval is expected shortly. Station will be headed by Dr. J. V. Dunworth, head of Reactor Division at Harwell . . . **Czechoslovakia plans** to start construction next year of its first atomic power plant—a facility of 100,000 to 200,000 kw.

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New York State Electric & Gas Corp has energized its 45-mi, 115,000-v Perry Gardenville transmission line. The line, designed and constructed to carry 230,000 v, will serve as a connection between Niagara Mohawk and NYSE&G.

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SEC Slates Probe

. . . challenging holdings of sponsors of OVEC and Electric Energy, Inc

Securities & Exchange Commission will begin hearings Feb 4 to determine whether sponsors of Electric Energy, Inc, and Ohio Valley Electric Corp should be allowed to retain their common stock ownership in these multi-sponsored companies.

SEC, in 1951 and 1952, gave qualified approval of the acquision of common stock in EEI and OVEC by the sponsoring firms without making all necessary statutory findings required under the Public Utility Holding Co Act. This was due to pressures of the Korean War and the necessity of providing quickly big blocks of power for atomic energy installations.

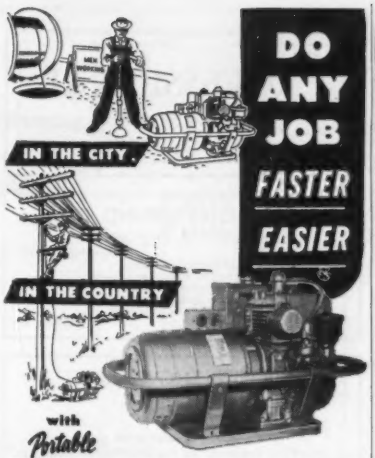
The qualified approval stated that "final determination of which companies should retain their interests" should be made "after the impact of the defense program on their respective interests is known and after the present emergency has passed."

At issue will be compliance with Section 10 of the Holding Co Act. This section provides that SEC can approve the acquisition of securities of a public utility company if the acquisition will not tend towards interlocking relations or towards the concentration of control to the detriment of the public or the interest of investors or consumers. Neither must the acquision unduly complicate the capital structure of the applicant's holding company system.

Further, SEC cannot approve the acquisition unless it will serve the public interest by tending towards the economical and efficient development of an integrated public utility system.

OVEC and its subsidiary, Indiana-Kentucky Electric Corp, were created by ten sponsoring companies; EEI by five sponsoring companies.

The hearing will have to determine whether some of these sponsors should divest themselves of their holdings and whether OVEC and EEI can be part of more than one holding company system since several sponsors are registered holding companies. The law, however, does not prohibit a holding company retaining an additional system incidental to the main system.



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JANUARY, 1957

Northeastern Weed Control Conference — Sheraton-McAlpin Hotel, New York City, Jan. 10-12.

Doble Engineering Co—24th Annual Conference of Doble Clients, Sheraton-Plaza Hotel, Boston, January 14-18.

Edison Electric Institute—Industrial Relations Committee, sponsored jointly by personnel section of Southeastern Electric Exchange, Sheraton-Park Hotel, Washington, D. C., Jan. 17-18; Industrial Power & Heating Group, New Orleans, La., Jan. 17-18.

Southeastern Electric Exchange—Personal Administration Section Meeting, held jointly with EEI, Sheraton-Park Hotel, Washington, D. C., Jan. 17-19.

American Institute of Electrical Engineers—Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

American Welding Society—Illinois Institute of Technology—3rd Annual Midwest Welding Conference, Illinois Tech Chemistry Bldg., Chicago, Ill., Jan. 30-31.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, Hotel President, Kansas City, Mo., Jan. 31-Feb. 1.

• **Pennsylvania Electric Association**—Transmission & Distribution Committee, Penn Harris Hotel, Harrisburg, Pa., Jan. 31-Feb. 1; Hydraulic Power Committee, Brunswick Hotel, Lancaster, Pa., Jan. 31-Feb. 1.

FEBRUARY

National Association of Purchasing Agents—26th Annual Mid-Winter Conference, Public Utility Buyers' Group, Brown Hotel, Louisville, Ky., February 3-5.

Edison Electric Institute—Prime Movers Committee, Deschler Hilton Hotel, Columbus, Ohio, Feb. 4-6; Transmission & Distribution Committee, Netherland Plaza Hotel, Cincinnati, Ohio. Feb. 7-8; Electrical System & Equipment Committee, Somerset Hotel, Boston, Mass. Feb. 7-8.

• **Pennsylvania Electric Association**—Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Pa., Feb. 7-8; System Planning Committee & Systems Operation Committee, Philadelphia, Pa., Feb. 14-15.

National Electrical Week—Second Annual Observance, Feb. 10-16.

Electric Institute of Washington—Electrical Trade Conference & Exposition, Shoreham Hotel, Washington, D. C., Feb. 12-14.

American Institute of Electrical Engineers—1957 Transistor & Solid State Circuit Conference, sponsored jointly with Institute of Radio Engineers and University of Pennsylvania, University of Pennsylvania, Philadelphia, Pa., Feb. 14-15.

National Society of Professional Engineers—Spring Meeting, Hotel Francis Marion, Charleston, S. C., Feb. 15-16.

13th Annual National Adequate Wiring Conference—Sherman Hotel, Chicago, Ill., Feb. 21-22.

American Society of Heating and Air-Conditioning Engineers—63rd Annual Meeting, Chicago, Ill., Feb. 25-28.

• **Institute of Radio Engineers**—Western Joint Computer Conference, Hotel Statler, Los Angeles, Calif., Feb. 26-28.

Pacific Coast Electrical Association—Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif., Feb. 28-Mar. 1.

MARCH

Southern Safety Conference—John Marshall Hotel, Richmond, Va., Mar. 3-5.

Louisiana State University—Annual Conference on High-Speed Computers, Baton Rouge, La., Mar. 5-8.

Northwest Electric Light & Power Association—Business Development Section, Empress Hotel, Victoria, B. C., Mar. 18-20.

Edison Electric Institute—Industrial Relations Committee, EEI Headquarters, New York City, Mar. 21.

Pacific Coast Electrical Association—Engineering & Operating Section, Hotel Statler, Los Angeles, Mar. 21-22.

Oklahoma Utilities Association—Biltmore Hotel, Oklahoma City, Okla., Mar. 27-28.

Illinois Institute of Technology—19th Annual American Power Conference, Hotel Sherman, Chicago, Ill., Mar. 27-29.

APRIL

• **Southeastern Electric Exchange**—Annual Meeting, Boca-Raton Hotel, Boca Raton, Fla., April 1-3.

• **Edison Electric Institute**—Main Accounting Conference held jointly with AGA, Washington, D. C., April 8-10.

• Additions this week

Glossary of Electric Terms Compiled by EEI Committee

A Glossary of Electric Terms—containing brief definitions of financial and technical terms in common use by the electric utility industry, has been published by Edison Electric Institute.

Compiled by EEI's Statistical Committee, the 47-page glossary includes practical definitions of over 300 terms which are designed to serve as a guide for laymen and utility personnel in preparing and interpreting electric utility industry statistics. In addition to the terms defined specifically, others are defined by cross reference in the 13-page index.

The first publication of its type printed since World War II, the glossary contains principally terms used in the EEI Annual Statistical Bulletin and in the annual statistical reports of individual utilities, insurance companies, and security analysts.

The definitions, according to EEI, "are not intended to spell out exactly the purpose, nature, or content of accounts and are not binding on member companies. They are not recommended for legalistic interpretations. However, they are regarded as generally descriptive of predominant and objective practice."

Single copies are priced at 50¢, with quantity discounts available, from EEI, 420 Lexington Ave., New York 17, N. Y.

where **POWER** is **VITAL**

ASCO AUTOMATIC TRANSFER SWITCHES help insure the safety of New York's subway millions

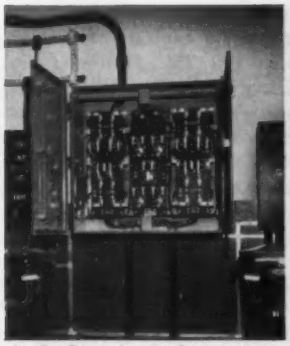
More than 4½ million commuters use the New York City subway system daily during the working week. Their safety is a major concern of the New York City Transit Authority. That is why the NYCTA insures against power failure with stand-by power. When normal power fails, ASCO Automatic Transfer Switches automatically transfer the load to the emergency source.

The Transit System's new and modern station at Grant Avenue in Brooklyn, N. Y., is typical. There ASCO switches assure continuous adequate-voltage power for a wide range of equipment: train signals, safety devices, station lighting, ventilation and drainage.

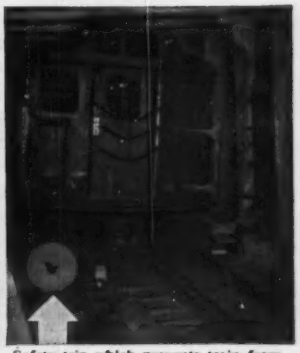
Dependable Control by ASCO

Wherever power and dependability are vital, ASCO switches provide these notable advantages: *continuous duty rating* in either normal or emergency position . . . *capacity* to withstand inrush currents 20 times full load rating . . . *rated* 750 volts A-C or D-C . . . *mechanical locking* to safeguard against vibration and electromagnetic effects . . . *single coil design* . . . *built-in time delay* so that equipment ignores harmless momentary outages . . . *full phase protection*, high thermal capacity, and many other design features and accessories. That is why safety-minded engineers specify ASCO – the one source for a full line of dependable automatic transfer switches. Write for Publication 596 on how to select an adequate automatic transfer switch.

Critical Subway equipment depends on continuity of adequate voltage power



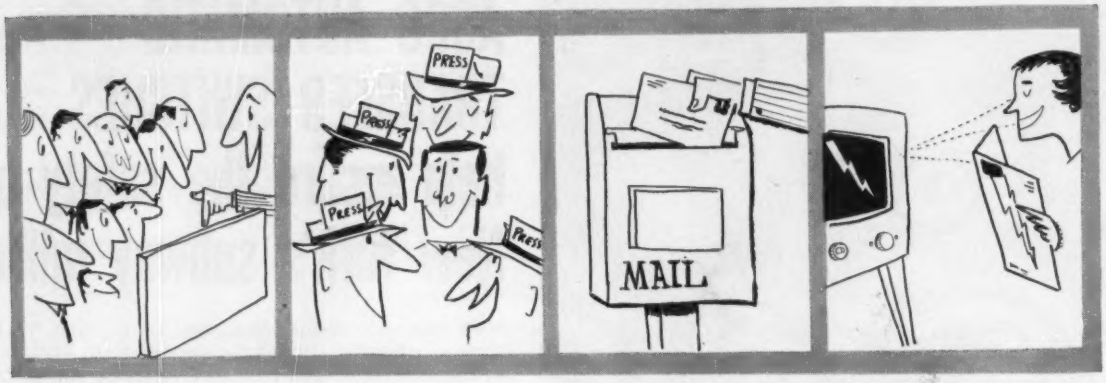
At the Grant Avenue Station of the NYC subway system, this electrical distribution room features ASCO Transfer Switches which "throw in" emergency power for station and tunnel lighting and safety devices.



Safety trip which prevents train from passing through red lights relies on ASCO switch for emergency power.

Automatic Switch Co.
397 Lakeside Avenue, Orange, N. J. • ORange 2-5300

ASCO



Tell Employees . . . Inform Press . . . Write Leaders . . . Show Public . . .

4-Step Plan Combats the Preference Clause

SAM SCHWIEGER, Director, Advertising and Public Relations, Southwestern Gas & Electric Co, Shreveport, La.

There is a way of getting understanding among the public on such issues as the inequity of the preference clause. As an example of what it takes to start doing a job on this one issue, our experience may be of interest and value. We haven't gained complete success by any means, but we believe we're on the way.

The problem: Explain the unfairness of the preference clause in federal legislation, the dangers inherent in it, and further encroachment of government in the power business. We tackled it by this four-step plan:

1. Explain it first to employees. Meetings were held every two months, on company time, in groups of 20 to 30 employees, with everyone taking part. Preference problems were outlined for discussion by thoroughly trained conference leaders. Employees heard methods the company planned to use, and the time-table for carrying the message to the people.

2. A series of conferences to explain the problem to the press, including radio and TV. Following dinner, Southwestern Gas & Electric Co President J. Robert Welsh told of the company's building program and its ability to meet power needs. He then explained preference clause problems. After this 25-minute presentation, a discussion period followed in which all present were invited to ask questions on any subject.

3. Contact community influence leaders. A representative group of community leaders was mailed material on the preference subject, and company personnel made personal contacts.

4. Inform the general public through advertising in all media, talks to civic groups, and similar means. This advertising and publicity effort will be expanded and continued.

Up to now we've been impressed by these developments:

- Employees were poorly informed, although we thought we had done more than most to explain preference. But they were tremendously interested. They wanted more information and conferences on the subject, and they appreciated the fact that the company started the program by telling them the reasons and plans for it.
- While we'd worked closely with the press and given them information, we found a woeful lack of knowledge. Conferences showed they are interested, and they, too, are ready to help present issues to the people. They like the idea of being counted in, of being informed.
- Community leaders have even a greater lack of knowledge of government-in-business problems. An almost unbelievable information void on such matters as atomic power was found among even Congressmen. By the same token, interest and, with most people, concern for the problem was revealed.
- We are convinced this problem-solving work can be done effectively only at the grass roots on a person-to-person basis. This is difficult, even expensive, and surely unglamorous work that will never be finished. But it's encouraging to know the job can be done and done effectively. People can be made to understand. When they do, they'll do what's right.
- This is a job that top management has to back completely. Employees quickly got the idea that it was important when Mr. Welsh appeared at meetings. He talked a number of times to conference leaders, saying this job was as important as the 100,000-kw plant addition, or anything else the company was doing. He presented the story at every press conference. No one can do this job but the president, and he has to be sold on its importance or employees and everyone else will sense the lack of executive support.

This four-step program is just the beginning for SG&E. It will need to be repeated again and again. And we're convinced if U. S. electric companies began to work on such a plan to take the information to the people some changes would take place soon.

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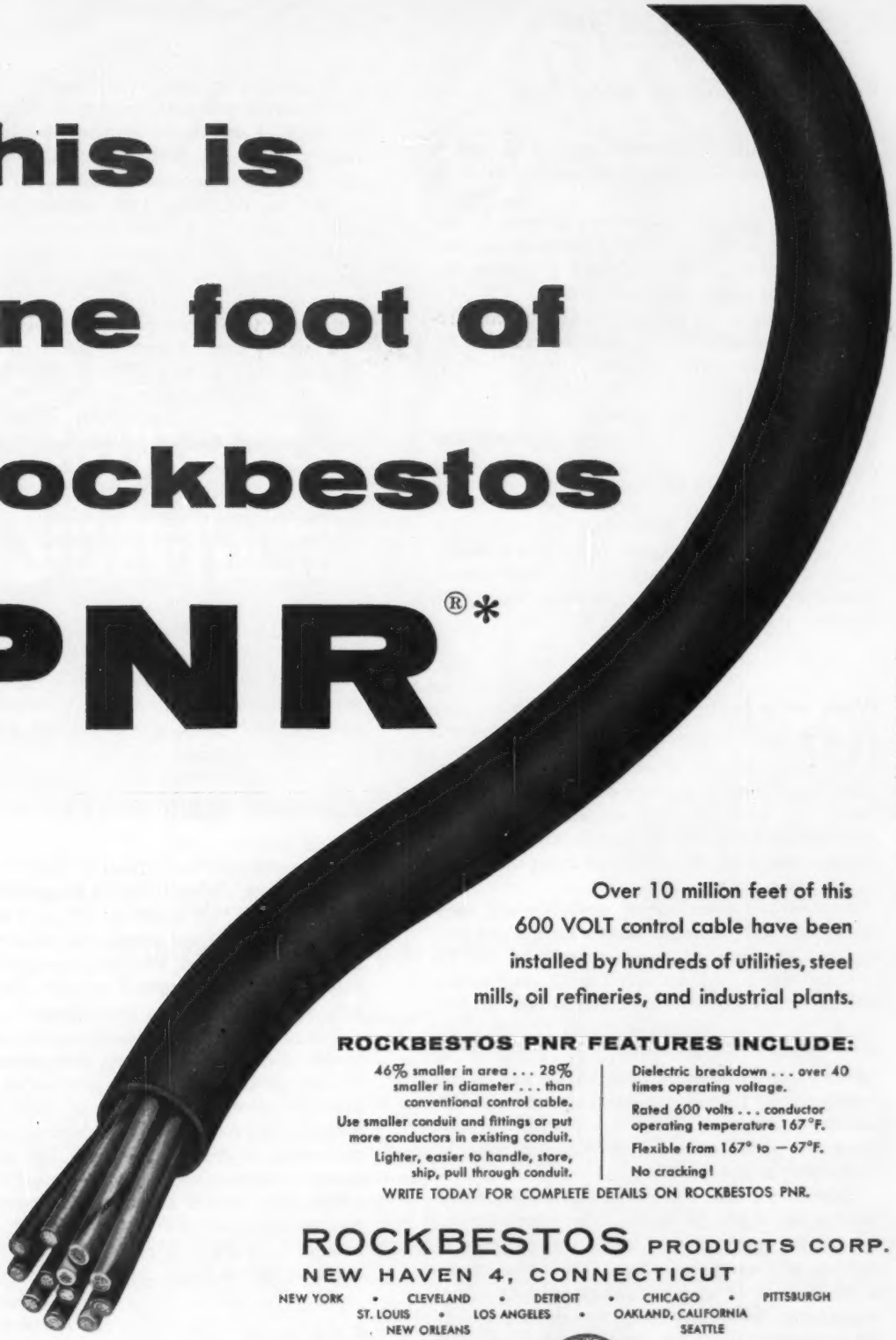

Over 10 million feet of this 600 VOLT control cable have been installed by hundreds of utilities, steel mills, oil refineries, and industrial plants.

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- Dielectric breakdown . . . over 40 times operating voltage.
- Rated 600 volts . . . conductor operating temperature 167°F.
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*P — polyethylene, N — nylon, R — Rockhide (PVC)

READERS FORUM

Requests Reprints of IR Article

To the Editor:

The "Industrial Relations Report" in the Oct. 1 issue is the best thing that I have seen on this subject, by far.

No doubt you will be receiving requests for reprints of this article; and as soon as reprints become available, we would like to order a quantity for supply to our Latin American Utilities.

I would appreciate information as to whether reprints will become available, and how soon.

Congratulations on a fine job.

P. W. Raymer
Manager
International Operations

Montreal Engineering Co, Ltd
Montreal 1, Canada

• Reprints of this 24-page article are now available. Single copies 25¢ reduced prices for bulk orders. Write Mrs. Edwin F. Schuster, Electrical World, 330 W. 42nd St., New York 18, N. Y.

Wary of a Future in Engineering

To the Editor:

The recent increase in engineering manpower requirements is predominantly of a military nature. There was no shortage of engineers in 1949. I graduated in 1949 and was very happy to accept a position paying $2,700 which was better than many of my classmates were able to do.

A study of the engineering profession will show quickly that this has never been a high paying profession. The average engineer working for the company I now work for with 7 to 12 years service in 1939 earned between $3,000 and $4,000. According to the U. S. Bureau of Labor Statistics, the 1939 dollar is today worth 52¢. Therefore an engineer today earning between $6,000 and $8,000 is no better off than an equivalent engineer of 1939. But this is not 1939. There is a shortage. We are living in a period when a tradesman is earning between $6,000 and $8,000.

Recently we took a group of high school seniors through our station (a medium size generation station). We discussed with them the prospect of studying engineering in college. They were unanimous in favor of studying almost anything except engineering. While they know that starting salaries for engineering graduates are today the highest in the country, they could see no long term advantage to engineering. They were much more interested in the salaries of 10, 15, or 20 years hence.

They asked me what would happen to the shortage if communism were suddenly to disappear from the earth. I was forced to agree that I thought a large part of it would immediately disappear. Then they asked me specifically what would happen to my job and my future if the shortage of engineers were to disappear. I could only answer that I hoped I would be high up enough or valuable enough so that I would not be affected. In fact I like to feel that this is already true.

In order to alleviate the shortage of engineers, it is necessary that present engineers on all levels be paid higher salaries. When a high school senior sees an engineer living in a modest home with a modest car and perhaps a 14-ft outboard in the back yard and then in another part of town sees big houses, big cars, and big cruisers at the nearby yacht club not owned by engineers, he can come to only one conclusion. Obviously, the people who hire engineers and hold the company purse strings do not think along the lines I suggest.

Name Withheld

• The students should be told that one of the causes of the shortage of engineers in low paying jobs is that an engineering education is often a stepping stone to administrative and executive positions. A study of "Who's Who in America" will confirm this.

Familiarize Public with PE's

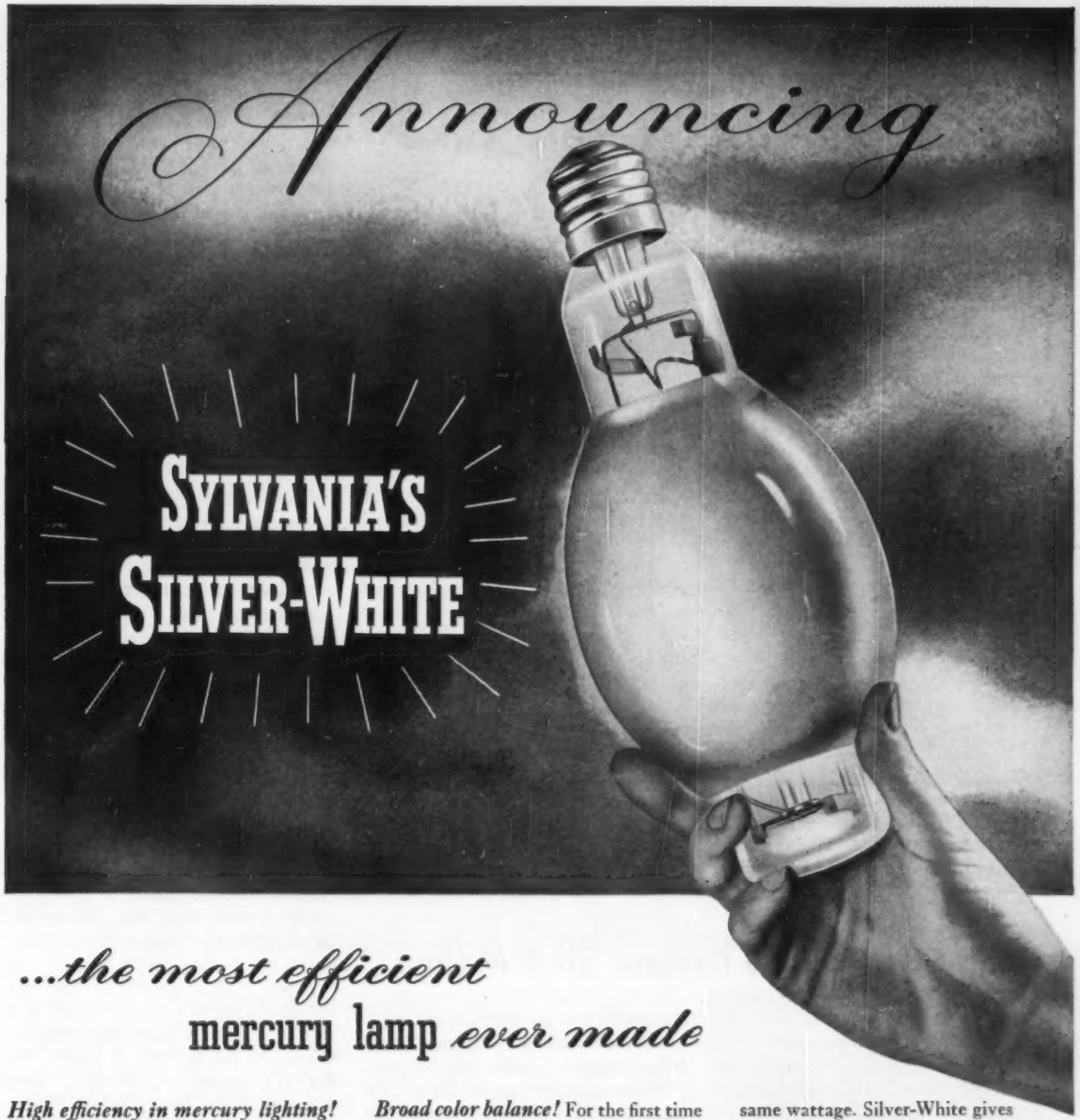
To the Editor:

Your editorial "Let's Identify Engineers" in the Nov. 12 issue is most timely. I am afraid, however, that the use of "EE or ME or CE, etc" would tend to confuse the general public. All doctors, whether they be obstetricians, surgeons, specialists, or just plain doctors, are identified by MD. So, why not have a single designation for engineers?

The profession of engineering is well established, legally. Every state, territory, possession, and district of the United States has enacted an engineering registration law, and each of these laws commences with a recognition of engineering as a learned profession. A registered engineer becomes a professional engineer and is entitled to a PE after his name. Next step is for all qualified engineers to become registered and then to use PE after their names. Soon PE will become as familiar to the public as MD is today.

Theodore Braaten
President

Connecticut Society of Professional Engineers
Butternut Drive
Norwich, Conn.



...the most efficient mercury lamp ever made

High efficiency in mercury lighting! In the search for better light, Sylvania's scientists have developed new phosphors that enable the Silver-White mercury lamp to produce 10 to 20 per cent *more* light than clear mercury lamps.

The new phosphor in this bulb actually *adds* light, where previous "color improvements" subtracted from the light of the ordinary clear mercury lamp. The silver-white coating on this bulb diffuses and softens the tremendous light output. No other type of mercury lamp gives you so much light for your lighting dollar.

Broad color balance! For the first time in mercury lighting you get radiation across the whole width of the color spectrum.

Lighting costs are reduced! The 400-watt Silver-White mercury lamp gives on the average 7 times the burning hours of life as compared with incandescent of the same wattage.

Sylvania's Silver-White mercury lamps are now available in ratings of: 100-watt, 175-watt and two 400-watt types. They cost no more than other color-corrected mercury lamps of the same wattage. Silver-White gives you brilliant, high efficiency lighting in the factory, service station, parking lot, and in street and highway lighting.

Our commercial engineering department will be glad to help you with your special application or installation problems. For complete technical data write directly to:

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Narragansett Asks Rate Hike

Rhode Island utility seeks approval of $2.5 million yearly increase in electric and gas rates. Says costs outrun organizational and technical efficiencies

Narragansett Electric Co for the first time in over 38 years is seeking approval for a general increase in both electric and gas rates in the three suburban areas which it serves.

Vice President and General Manager R. E. Nock said if the increase is approved by the State's Department of Business Regulation it will take effect Jan. 1 and mean less than three cents per day for the company's 172,000 electrical customers. For both electical and gas customers the increase would total $2.5 million a year but because of taxes it will increase revenue by ony $1,450,000 per year.

Nock pointed out that wage advances, higher taxes, and other rising costs are such that they can no longer be absorbed by operating economies and increased sales.

Since 1930 the company has given rate reductions resulting in annual savings to customers of $2.6 million.

Proposed new rates for residential customers are $1.15 per month for the first 16 kwhr or less, plus 5.5¢ each for the next 34 kwhr plus 4.5¢ for the next 40 kwhr, plus 3.5¢ for the next 110 kwhr, plus 2.8¢ each for all above 200 kwhr. The present minimum charge is $1 for the first 16 kwhr and the lowest is 2.5¢ each for all above 200 kwhr per month.

The company seeks approval of an escalator clause which would affect residential users according to future increases or decreases in fuel costs. Rising fuel costs, last year totalling $8 million, as against $5.3 million in 1954, are expected to reach over $11 million in 1957. The company is also seeking approval of bi-monthly billing in its application.

In full-page ads carried in area papers, Narragansett Electric explained the necessity of the increase to its customers. For example it noted that the average hourly wage rate for five typical employee classifications has risen from 82¢ in 1940 to $2.08 in 1956. Costs of electric meters have gone up from $8.59 in 1940 to $16.80 in 1956. Federal taxes have increased from $834,104 in 1940 to $2,154,315 in 1956. In the ad, the company said, "We now have reached the point where economy and efficiency by themselves no longer can carry us through. Increased revenue is a necessity."

Penn P&L Told to Refund $6.3 Million

Pennsylvanvia Power & Light Co has been ordered to make a system-wide refund of $6,320,738 to customers. The State Public Utility Commission in ordering the refund said that it covered "excessive charges" and interest for a 2½ year period ending Feb. 28, 1955. The commission said it was the largest refund it had ever directed.

The order resulted from a Superior Court order which required PP&L to eliminate as an operating expense the annual amortization of amounts it paid in excess of original cost to purchase smaller utilities merged into its system.

This expense was allowed by the PUC in a 1952 order appealed by 198 manufacturing plants and business places. Acting on the appeal, the State Superior Court disallowed the amortization expense in 1954 and the order was returned to the PUC for review after the Supreme Court refused to look into the case last year.

Revising its findings in light of the court directives, the PUC found that the utility had collected an excess of $5,267,280 in rates from its consumers during the 2½ year period fix for the refund.

In addition the PUC called for interest totalling $1,053,456 also to be paid customers bringing the total refund to $6,320,736.

PP&L's rates were reset under a PUC order of last year which brought the rate structure in line with the court order concerning the amortization expense. Thus current rates will remain the same.

PP&L was directed to start refunds with bills going out next Feb 1 and to show the PUC by the following May that they have been completed.

Group Shelves Changes In Oregon Utility Tax

An Oregon legislative interim subcommittee chairman on utility taxes has announced the subcommittee will make no recommendation for change in the taxation program of the state affecting municipal systems, REA cooperatives or PUDs.

State Rep Charles A. Tom of Rufus reported the policy at a public hearing Nov. 9 of the full tax committee in the state capitol at Salem where two legislators called for changes they said imposed an inequity on taxpayers in areas served by private utility companies. State Sen Phillip B. Lowry of Medford and State Rep Wayne R. Giesy of Monroe joined in complaining of the existing policy.

Lowry cited Eugene Water & Electric Board, the state's largest municipal system, which he contended escaped bearing its full tax load in Eugene on the $17 million of property. This claim prompted Henry Beistel, EW&EB representative, to report the system paid 6% of its earnings to the city of Eugene.

FINANCIAL BRIEFS

Consolidated Edison Co of New York has advised Mayor Robert Wagner that it is willing to submit a proposal for the purchase of the city's three traction power plants and to supply the city under a long term contract. Con Ed's Pres H. C. Forbes suggested in the letter of Nov. 26 that "a competent and disinterested firm of consulting engineers, that is mutu-

Hydroelectric plant of The Washington Water Power Company at Cabinet Gorge, Washington.
This is the highest head installation in the United States using both fixed blade and Kaplan turbines.

282,000 H. P. produced at lowest cost by fixed blade and Kaplan turbine team

In operation at the Cabinet Gorge hydroelectric plant of The Washington Water Power Company are three Baldwin fixed blade propeller turbines and one Baldwin Kaplan turbine.

These unusual 6-blade Baldwin units were designed for a normal head of 90 feet with a rating of 70,500 H.P. each at 120 R.P.M. Under certain conditions, the head reaches 105 feet, which increases total output to over 325,000 H.P. In terms of horsepower capacity, the fixed blade turbines are the largest ever installed in the United States. Each type of turbine has its own inherent advantages, and by using them in proper combination, the Cabinet Gorge plant is able to operate at maximum efficiency on a minimum investment.

All over the world, hydroelectric plants are reaping the benefits of Baldwin's 130 years' experience in designing and building hydraulic power equipment. Since we build all four basic types (Impulse, Kaplan, Francis and Propeller), our engineers can make unbiased recommendations on the type best suited to *your* flow and head requirements. On your next project, call us in early. Write BLH Corporation, Philadelphia 42, Pennsylvania, or Dept. 5707, Pelton Division, 2929 Nineteenth St., San Francisco 10, California.

Inspecting the hub mechanism of the Kaplan turbine.

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ally acceptable to the city and the company, be retained and assigned the duty of evaluating the company's offer and advising the city as to its merits. In the interest of maintaining an atmosphere of impartiality it seems to me that it would be appropriate for the city and the company to share equally the fee of the engineering firm." No immediate reply was forthcoming from Mayor Wagner.

Kansas Gas & Electric Co will pay Dec. 28 a quarterly common stock dividend of 33¢ a share as compared with 30¢ a share in the previous quarter.

Paine, Webber, Jackson & Curtis is making a secondary offering of 22,000 common shares of **Idaho Power Co** at $31.25 a share, less a 75¢ a share concession.

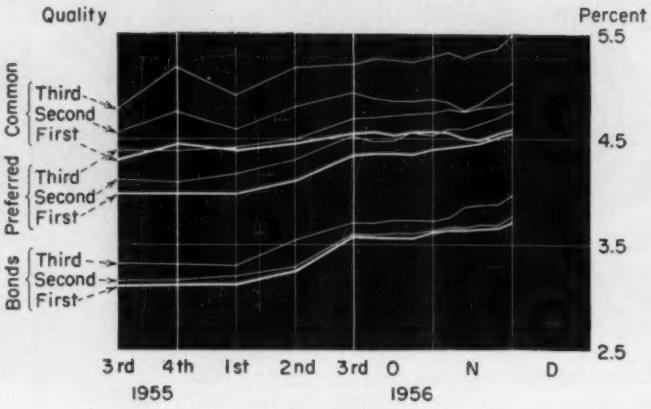
Securities and Exchange Commission has adopted a new rule providing for use of summary prospectuses for securities registered under the Securities Act of 1933. Rule is aimed at encouraging dissemination of information among prospective investors.

Detroit Edison Co's Pres Walker L. Cisler told a special informational meeting for stockholders recently held in the Detroit area that the ratio of operating expense to gross revenue came down from 62.8% in 1952 to 55.2% at present. Return on average invested capital, he said, went from 4.82% in 1952 to 5.73% now.

REGULATION BRIEF

Interior Department has submitted to the Federal Power Commission for approval a revised rate schedule for the **Southwestern Power Aministration.** New schedule calls for a rate of 6.97 mills at a 50% load factor delivered to customers' load centers. Present rate is 5.51 mills set in 1947 on an interim basis until the federal power projects were more nearly completed and their actual costs and operation and maintenance expenses were determined. Revised schedule also calls for capacity charge of $1.60 a month and energy charges of two mills for first 150 kwhr, three mills for the next 290 and five mills for all above 440 kwhr.

Today's Utility Yields (%)



	Bonds			Preferred Stocks			Common Stocks		
Quality	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Nov. 29	3.72	3.77	3.97	4.56	4.77	4.85	4.59	5.03	5.49
Nov. 22	3.66	3.68	3.89	4.51	4.70	4.82	4.55	4.95	5.37
Nov. 15	3.65	3.69	3.88	4.47	4.64	4.80	4.50	4.83	5.33

Utility Earnings . . .

Company	Period Months Ended		Net Income 1956	Net Income 1955	Earnings Per Common Share 1956	Earnings Per Common Share 1955
Alabama Power	12	Oct.	$15,206,355	$13,736,710	$....	$....
California Electric Power	12	Sept.	3,473,171	2,985,122	1.00(a)	0.93(a)
Carolina Power & Light	12	Oct.	10,120,721	9,003,916	1.60(b)	1.63(b)
Central Illinois Public Service	12	Oct.	9,021,920	8,675,740	2.30(f)	2.31(f)
Central Illinois Light	12	Oct.	5,042,504	3,806,080	4.22(a)	3.30(a)
Central Maine Power	12	Oct.	6,452,705	6,927,868	1.67	1.83
Central Vermont Public Service	12	Sept.	1,375,002	1,427,431	1.23(a)	1.31(a)
Cincinnati Gas & Electric	12	Sept.	16,041,204	13,262,054	2.09(g)	1.79(g)
Detroit Edison	12	Oct.	28,074,595	25,941,559	2.39(a)	2.40(a)
Houston Lighting & Power	12	Oct.	17,229,401	14,483,108	2.89	2.41
Iowa Southern Utilities	12	Oct.	1,488,276	1,334,281	1.82(h)	1.62(h)
Kansas City Power & Light	12	Oct.	9,180,141	7,738,905	2.77	2.34
Middle South Utilities, consolidated	12	Oct.	16,053,308	14,576,710	2.11	1.92
Minnesota Power & Light	12	Oct.	4,096,151	4,020,749	2.05	2.00
New York State Electric & Gas	12	Oct.	11,282,368	10,740,138	2.90(i)	3.02(i)
Northern States Power	12	Sept.	20,288,188	18,100,831	1.20(j)	1.11(j)
Ohio Edison	12	Oct.	24,512,516	23,030,995	3.75(a)	3.49(a)
Pacific Gas & Electric	12	Sept.	75,728,566	69,455,373	3.51(k)	3.22(k)
Pennsylvania Power & Light	12	Oct.	24,298,873	21,960,693	3.46	3.07
Portland General Electric	12	Oct.	5,036,621	4,915,555	1.68	1.64
Public Service of New Hampshire	12	Oct.	4,245,429	4,248,221	1.23(a)	1.35(a)
Quebec Power	9	Sept.	906,511	816,093	1.35(m)	1.22(m)
Shawinigan Water & Power	9	Sept.	8,210,172	6,368,202	3.06(n)	2.32(n)
Southern, consolidated	12	Oct.	29,553,970	25,484,983	1.50(o)	1.41(o)
Southern Indiana Gas & Electric	12	Oct.	2,304,524	2,479,477	1.90(p)	2.26(p)
Tampa Electric	12	Oct.	3,920,704	3,304,217	1.61(q)	1.34(q)
Texas Utilities, consolidated	12	Oct.	27,893,175	23,926,659	2.28(r)	2.03(r)
Utah Power & Light	12	Oct.	7,534,820	6,754,632	1.70(s)	1.52(s)
Virginia Electric & Power	12	Oct.	20,646,693	19,041,809	2.72	2.54

Notes—(a) Based on average shares; (b) Based on 5,330,000 shares in 1956 and 4,600,000 shares in 1955; (f) Based on 3,463,600 shares in 1956 and 3,293,600 shares in 1955; (g) Based on 7,140,000 shares in 1956 and 6,800,000 shares in 1955; (h) Based on 756,791 shares in 1956 and 753,383 shares in 1955; (i) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955; (j) Based on 14,089,328 in 1956 and 13,418,408 shares in 1955; (k) Based on 16,458,931 shares in 1956 and 16,255,733 shares in 1955; (m) Based on 669,474 shares in 1956 and 667,770 shares in 1955; (n) Based on 2,428,797 shares in 1956 and 2,415,833 shares in 1955; (o) Based on 19,594,946 shares in 1956 and 18,087,643 shares in 1955; (p) Based on 996,363 shares in 1956 and 913,333 shares in 1955; (q) Based on 2,172,855 shares in 1956 and 2,151,862 shares in 1955; (r) Based on 12,210,000 shares in 1956 and 11,810,000 shares in 1955; and (s) Restated on basis of 4,440,500 shares outstanding after 2-for-1 split in Oct. 1956.

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

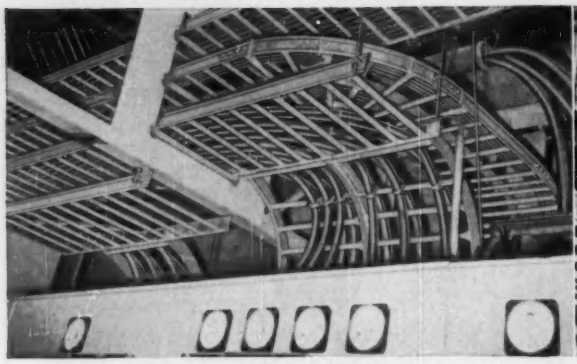
Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

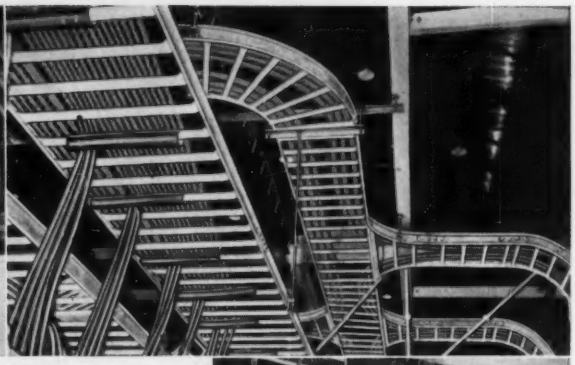
What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-12, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (I) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO





WHAT AN INSPIRATION—

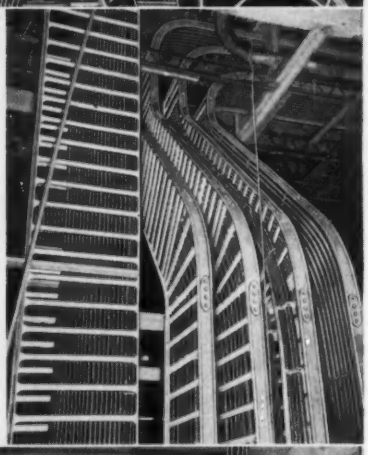
this installation of...

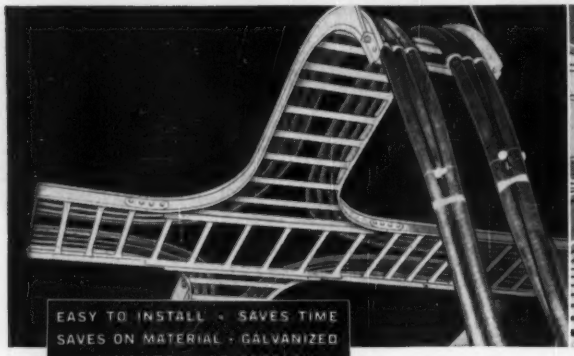
Globetray* RACEWAYS

at

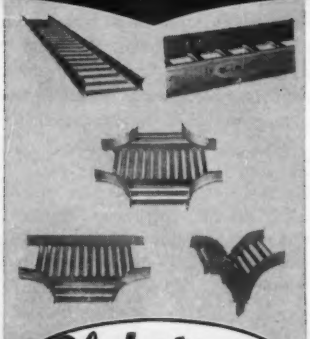
INSPIRATION COPPER MINES

Miami, Arizona





EASY TO INSTALL • SAVES TIME
SAVES ON MATERIAL • GALVANIZED
NO MAINTENANCE PROBLEM



Globetray, a new, superior system of CABLE and TUBING RACEWAYS, is a completely engineered method of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The Universal splice plate joins all parts through the side channels only and all curved fittings are joined at the ends of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Available in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Globetray can be cut to length at *any* point — insides and bottom always smooth — all sections punched for easy installation — a perfect fit at all times. Neat, clean and uniform in appearance.

Write for new, complete catalog. Distributors in all principal cities. Contact the Globetray distributor under "conduits" in the classified telephone directory.

* Pat. Pending

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CHICAGO 9 ILLINOIS

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Manufacturers Since 1914
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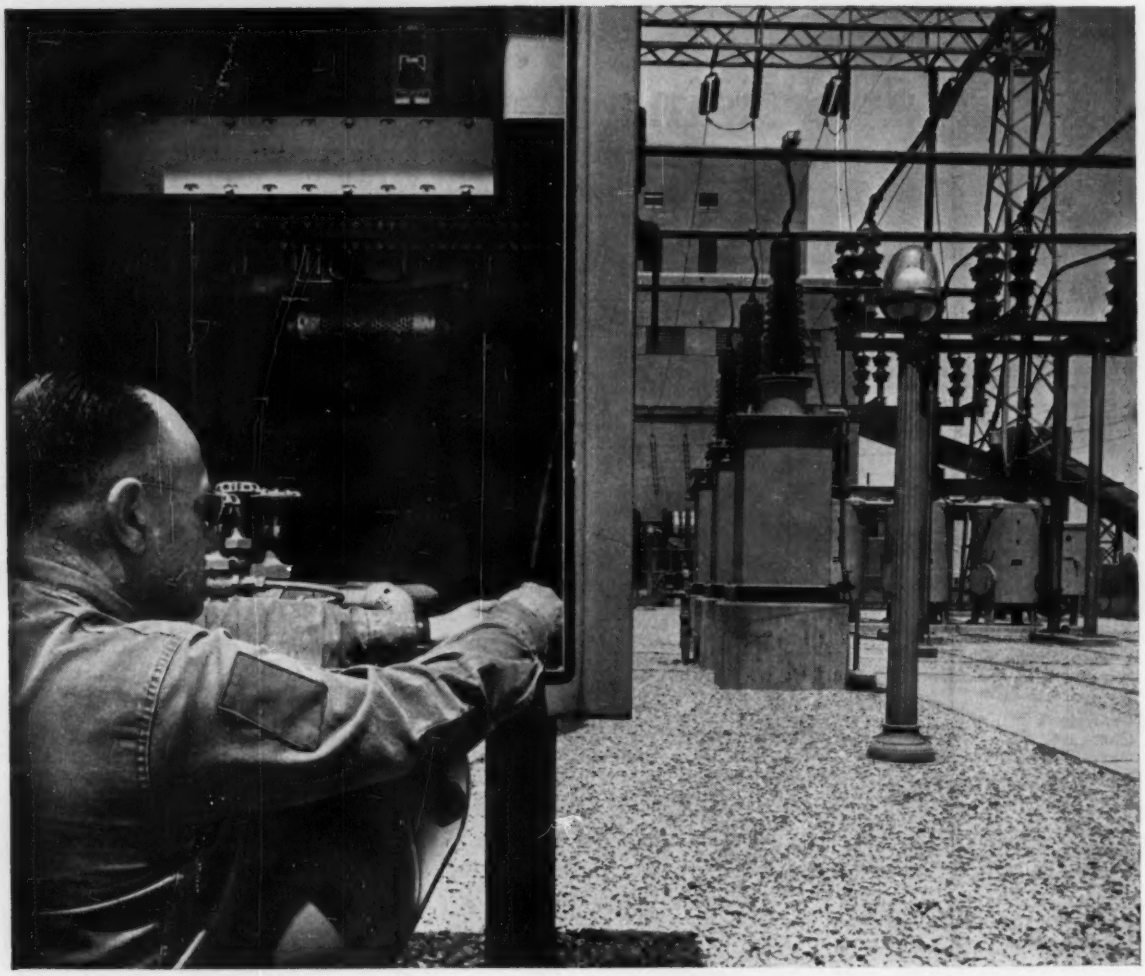


Rome station control cable helping Niagara Mohawk to meet load growth

Western New York was stretching its muscles, but it needed more electrical power in order to keep growing.

Niagara Mohawk met this need with a new addition to its power system, a 204,000-kw steam plant right on the edge of Lake Erie—all the power this booming area needed. One of the most modern in the world, the Dunkirk station is wired with Rome station control cables.

Why *Rome* cable?

Well, first of all, because of the proved dependability of Rome thermoplastic control cables, even under tough operating conditions. A sturdy Rome Synthinol jacket provides exceptional resistance to moisture, corrosion, abrasion, and flame.

Secondly, Rome's thermoplastic control cables can be installed faster. They're easier to handle, strip, and splice; and they have a high-gloss, low-friction surface which permits easy pulling through conduit and into control cabinets.

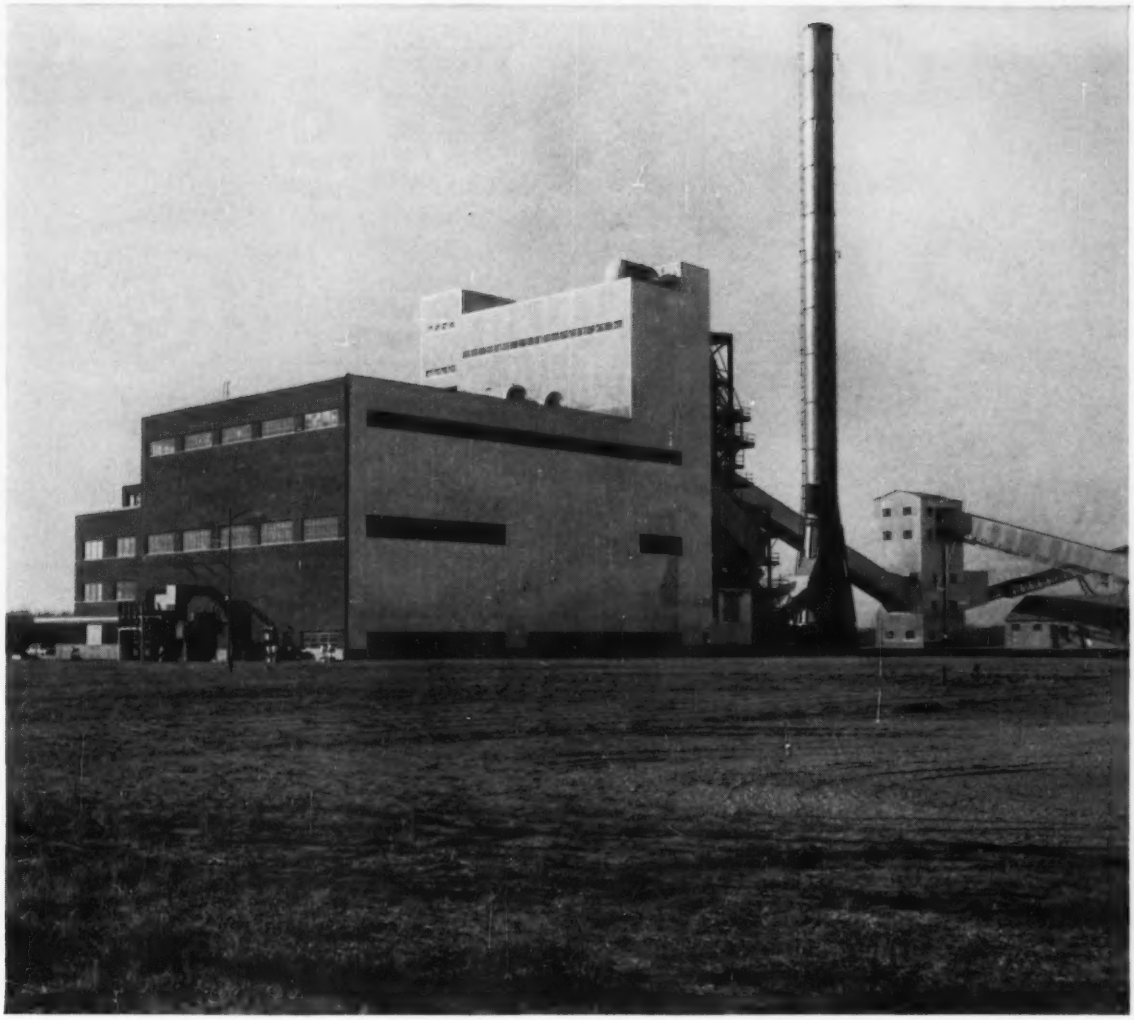
Finally, the use of Rome's tough control cables reduces cable maintenance problems to an absolute minimum. The individual conductors in the Dunkirk installation are insulated with RoLene (polyethylene), which is unaffected by water absorption, electro-osmosis, and low temperatures—conditions that often cause service interruptions.

This Rome cable can be buried in earth, installed in ducts, trays, racks, strung aerially, or run in circuits combining all of these. And it is recommended for operating temperatures up to 75°C. All in all, Rome's station control cable is an excellent choice for demanding applications like this one.

Contact your nearest Rome Cable representative for more information—or write to Department 3, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION



IOWA POWER & LIGHT COMPANY Power Station #1 Unit, Council Bluffs, Iowa

Leading Power Companies Use Exide Batteries

Typical of America's myriad power generating plants upon which whole communities depend is the Iowa Power & Light Station # 1 Unit, Council Bluffs. This one plant, with its 40,000 kilowatt capacity, and linked with other generation plants throughout the Iowa Power & Light properties, assures a continuity of service to all Iowa Power & Light users.

Basic to the job of keeping the plant producing is the 60-cell EME-25 Exide-Manchex Battery for control and emergency service. This battery provides power to trip and close switchgear, for emergency lighting, bearing lubricating pumps, and stand-by power to the substation control house.

The reason for the outstanding performance of Exide-Manchex Batteries in this service lies in their unique design and construction. In countless applications, these batteries deliver years longer service, and lower operating costs, than other types. No other battery can offer the same advantages. For complete information, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.

Exide®

Dependable power for control and emergencies. This 60-cell Exide-Manchex Battery plays a major role in keeping the Council Bluffs plant in operation. The dependability and long life for which these batteries are famous are especially vital in power company service. When you order batteries, be sure to specify Exide-Manchex.

NO false alarms...
NO service interruptions

with

Thermalite

Overload Indicators

THE *Thermalite* indicator does not respond to momentary abnormal conditions. It does not interrupt service to your customers at any time — in any way. The brilliant red light gives warning of overloads. It takes the following load factors into account automatically: (1) high ambient, (2) amount of overload, and (3) duration of overload.

Eliminates Expensive Surveys

Visible for hundreds of feet, the *Thermalite* indicator can be checked from a service truck. Overloaded transformers are singled out without the expense of a complete survey. Replacement or other system changes may be made at your convenience.

Greater Utilization Possible

You can stretch transformer dollars by taking advantage of the inherent overload capabilities of distribution transformers on your system. *Thermalite* indicators let you use this capability without endangering service continuity.

Low-cost *Thermalite* indicators are available on Allis-Chalmers distribution transformers 167 kva and smaller, 15 kv and below. For complete information, contact your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wis.

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